Exhibit A

☐ EXPEDITE
☐ No hearing set
☒ Hearing is set
Date: 10/31/2008
Time: 9:00 a.m.
Judge/Calendar: HONORABLE CHRIS WICKHAM

SUPERIOR COURT OF THE STATE OF WASHINGTON
FOR THURSTON COUNTY

DAROLD R. J. STENSON,

Plaintiff,

v.

ELDON VAIL, Secretary of Washington Department of Corrections (in his official capacity); *et al.*,

Defendants.

No. 08-2-02080-8

DECLARATION OF DR. MICHAEL J. SOUTER

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DECLARATION OF DR. MICHAEL J. SOUTER

I, MICHAEL J. SOUTER, hereby declare as follows:

A. Background and Experience With Lethal Injection Issues

1. I am an Associate Professor of Anesthesiology and Neurosurgery at the University of Washington and Attending Physician for Anesthesiology and Critical Care at Harborview Medical Center. I am licensed to practice in Washington State, and by the General Medical Council to practice in the United Kingdom and European Union. I belong to the American Society of Anesthesiologists, the Washington State Society of Anesthesiologists and numerous other anesthesiology and professional associations. I attach my resume which details my training, professional experience and publications (Exhibit 1).

2. I have studied the historical, medical and legal aspects of capital punishment by lethal injection and have given two professional presentations on the subject: "Capital Medicine—Lethal Injection and the Medical Practitioner, Ethics Forum, Harborview Medical Center, Seattle, Washington—January 2008" and "Lethal Injection and the Anesthesiologist, Washington State Society of Anesthesiologists, Seattle, Washington—March 2008." I include a printout of a Power Point presentation that I gave at the March 2008 meeting of the Washington State Society of Anesthesiologists (Exhibit 2).

3. I make this declaration to assist the Court in understanding the medical significance of the drugs used in lethal injection executions, how the drugs are administered, complications that can arise if administered improperly and the necessity for safeguards against improper administration of the drugs.

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B. Washington Department of Corrections' Policy for Administration of Lethal Drugs

4. The only Washington Department of Corrections ("DOC") written policy that includes any procedures for lethal injection executions is Policy No. DOC 490.200 (revised June 21, 2007) (Exhibit 3). That policy calls for the administration of three drugs: (i) thiopental sodium, (ii) pancuronium bromide and (iii) potassium chloride.

5. Sodium thiopental is a barbiturate used for sedation. It wears off within 10–30 minutes. It has a half-life of 4.6–8.5 minutes as it rapidly distributes to other body tissues, and this distribution is increased under conditions of extreme anxiety or excitement. Previous drug use by a patient may require increased dosages of the barbiturate to ensure adequate sedation. Because the drug has a high alkaline content, if it enters tissues outside the vein, it causes pain, sloughing and necrosis.

6. The second drug, pancuronium bromide, is a paralytic agent. The third drug, potassium chloride, is a drug that interferes with electrical signals that stimulate heart contractions and induces cardiac arrest. This third drug is the drug designed to cause death.

7. The second drug, pacuronium bromide, inhibits muscular-skeletal movements by disengaging the chemical signaling between the nerves and the body. It may be considered as being used essentially for the benefit of the witnesses to the execution—muscle contractions or body movement can be disturbing during the execution process. The effects of this drug last 100–120 minutes, but it is also lethal on its own as an asphyxiant; it eventually stops breathing. This drug has no sedative effect.

8. If the inmate is not very deeply sedated, injection of the second drug would give rise to a feeling of suffocation and would also pharmacologically accelerate the heartbeat, while administration of the third drug will cause severe and excruciating pain in

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the peripheral veins and in the chest. Potassium chloride is frequently prohibited for use as a single agent for animal euthanasia due to that reason. There is no medical debate as to whether inadequate sedation will cause extreme pain. It is a medical certainty that excruciating pain *will* result if the inmate is not adequately sedated. It is therefore essential that safeguards be in place to assure adequate sedation.

C. Assuring Proper Sedation—Contrasting How It Is Done in a Medically Professional Manner Versus the Lethal Injection Setting

9. When physicians sedate hospital patients, trained personnel (i) ensure the proper identification, mixing and measuring of drugs, (ii) establish the proper siting and functioning of intravenous access for the drugs and (iii) constantly monitor the depth of sedation including checking for purposeful or reflex movements.

10. However, in the execution setting, injection of the second drug, pancuronium bromide, masks evidence of inadequate sedation because the inmate becomes completely paralyzed. This makes it even more important that the sedation is done properly in all respects.

11. The first step to assure proper sedation is to assess necessary dosage and anticipate any particular problems that may arise by considering the specific patient's body type and condition and reviewing the patient's medical history. Problems could include, for example, prior opiate, sedative or alcohol use which could require greater dosage, or poor vein condition or obesity which would cause difficulty in siting the intravenous ("IV") tubing into the patient's body. Previous intravenous drug abuse, diabetes and peripheral vascular disease may offer particular challenges to siting IV tubing. Consideration needs to be given to these individual factors to know what dosage and techniques will best assure adequate sedation.

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12. While proper dosage varies by individual circumstances, the DOC's policy does not take into account the need to vary dosages depending on individual circumstances. The DOC's policy calls for a standard 2 grams of thiopental sodium for sedation for every inmate. The effectiveness of this dosage is dependent on the speed of delivery to the circulation, as constant redistribution will remove thiopental from circulation into the fat and muscle stores of the body. If injection is slow and prolonged, 2 grams may be insufficient to induce a sufficiently deep level of sedation that would avoid extreme suffering from the subsequent administration of pancuronium bromide and potassium chloride.

13. Once the proper dosage is assessed and consideration is given to possible complications, the next step in assuring proper sedation is to assure proper acquisition, storage, mixing and measurement of the drugs. Sodium thiopental is a powder that must be mixed prior to use. There is evidence of mistakes having been made previously in calculation of dosage and concentration.

14. Next, proper intravenous siting and flow must be assured. In the hospital setting, trained anesthesiologists and other medical professionals are at the patient's side, constantly monitoring the patient. In the execution setting, the inmate is strapped on to an execution table in an execution room. Injection team members insert the IV lines into the inmate's body and then they typically leave the room. The drugs are not located adjacent to the inmate. Rather, the IV lines generally extend about 8 feet from the inmate into a separate room where the actual bags containing the drugs are located. The people releasing the drugs therefore are nowhere near the inmate, the drugs have to travel a significant distance to reach the inmate and that distance further compromises the ability of the people administering the drugs to monitor the inmate's consciousness.

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15. Washington, like other jurisdictions, provides for a saline flush between the administration of the second and third drugs. This is necessary because otherwise the drugs would react chemically and create a chalky substance that would impede the flow of the subsequent drugs into the body. Consequently, the combined amount of fluid that must enter the inmate's body—between the three drugs and the two saline flushes—is considerable. To ensure that all of the fluid travels the necessary distance along the IV lines and is completely injected, considerable force is typically used. Thus, Washington's policy calls for a "bolus" injection, which means an injection in high quantity, as opposed to a gradual flow.

D. Failure to Establish Adequate Safeguards Has Resulted in Many Botched Executions

16. There are many ways that inadequate training and procedures can, and have, caused excruciating executions. One of the most common problems relates to the placement of the flexible plastic IV tubing (called "cannula") that carries the drugs. The chances of successful placement of the cannula varies inversely with its size and is also affected by an inmate's prior drug use, anxiety and fear. There have been occasions, when the person siting the cannula apparently was unable to secure it to peripheral veins, in which a "cut down" procedure was used which involves making incisions into the body in order to locate a vein. This is a very invasive and painful procedure and it requires a modicum of surgical training beyond that normally available to paramedics, nurses, and many physicians. Washington's policy does not preclude this procedure.

17. Excessive force used to inject the drugs can dislodge the cannula or burst the vein, allowing the drugs to leak into other tissues. There have also been instances of the cannula becoming obstructed, and cutting off the intended flow of the drugs.

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18. A few examples of botched executions that illustrate what can happen without sufficient safeguards include the following. In May 2007, Christopher Newton's execution in Ohio took 2 hours. In December 2006, Florida officials had trouble executing Angel Diaz when drugs leaked into tissues and required a second administration of drugs. In May 2006, it took 90 minutes to execute Joseph Clark in Ohio. Prison staff had problems tapping a vein and the cannula dislodged into tissue. In November 2001, it took Jose High 69 minutes to die in Georgia. After trying unsuccessfully to tap into veins in his arms and legs, prison staff ultimately succeeded in placing the cannula in his neck. Emmitt Foster, executed in Missouri in May 1995, was gasping and convulsing after seven minutes because restraints were obstructing the flow of drugs; after 20 minutes a medical examiner loosened the straps and the execution proceeded. In May 1994, John Gacy's execution aborted when lethal chemicals unexpectedly solidified, clogging the cannula that led into Gacy's arm. The tube was replaced and the execution proceeded. In March 1992, it took Arkansas officials 50 minutes to execute Ricky Rector due to difficulties siting the cannula in his body. In 1988 in Texas, the cannula dislodged from Raymond Landry, spraying lethal chemicals all over the execution chamber. The cannula was resited and the execution resumed.

19. In order to assure a sufficiently deep plane of unconsciousness, it is essential that the entire quantity of the drugs designated for the execution actually find its way into the inmate's body. If the full amounts of the drugs were in fact injected, those approximate amounts should be in the body after death. Whether this in fact happens was the subject of a study of toxicology reports by University of Miami researchers (in cooperation with an attorney representing death row inmates) published in the medical journal *The Lancet* in 2005. They analyzed 49 executions in Arizona, Georgia, North Carolina and South Carolina and reviewed the amounts of the drugs in the inmate's bodies taken between 12 and 24

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hours after death. Their analysis showed post-mortem concentrations of thiopental in the blood lower than that required for surgery in 43 of the 49 executed inmates (88%) and that 21 (43%) had concentrations consistent with awareness. The authors concluded that there was a substantial probability that some of the inmates were, in fact, aware and suffered extreme pain during execution. (The results of the study may actually be understated since the weight of medical opinion is that sodium thiopental actually increases in concentration after death.) The study is titled "Inadequate anaesthesia in lethal injection for execution," authored by Leonidas G. Koniaris, Teresa A. Zimmers, David A. Lubarsky and Jonathan P. Sheldon, published in *The Lancet*, Vol. 365, page 1412, April 16, 2005 (Exhibit 4).

E. Lethal Injections Team Members Are Often Not Qualified Or Properly Trained

20. States have had difficulty attracting qualified medical personnel to participate in executions. As a consequence, when courts require disclosure of the qualifications of persons on execution teams, it may show that the government is using grossly unqualified or compromised personnel. For example, when the federal court in *Morales v. Tilton*, 465 F. Supp.2d 972 (N.D. Cal. 2006), required discovery and reviewed who the State of California was using to administer lethal injections, it found that that one former team leader had been disciplined for smuggling illegal drugs into the prison and another led the execution team though he was disabled by post-traumatic stress disorder.

21. The court also found that the California procedures suffered from lack of knowledge of the nature or properties of the drugs, or risks or possible problems associated with the lethal injection procedure. The record-keeping was inconsistent and unreliable. There were some instances where all of the sodium thiopental had not been injected and other cases where there were no contemporaneous records showing that it was. Execution logs were sometimes incomplete, illegible or overwritten. Team members admitted to

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failing to follow manufacturer directions for the mixing, preparation and administration of the drugs. The execution chamber had not been designed for lethal injection executions. The lighting was too dim and execution team members were stationed too far away to observe the inmate and accurately determine consciousness and the response to injection.

F. Whether Washington's Lethal Injection Policy and Procedures Meet Constitutional Standards Requires Discovery of What the State Is Doing in Practice, and Fact Finding by the Court to Determine Whether That Meets Constitutional Standards

22. The *Morales* court found that there were systemic flaws in California's lethal injection process—but only after significant discovery and fact-finding. As I discussed above, there are many variables that need to be controlled to maximize the likelihood that a person is adequately sedated. Determining whether the State of Washington has any requirements for qualifications, training and procedures, and what happens in actual practice, are areas that this Court would need to discover and evaluate as the court did in *Morales*. The DOC's present written protocol for lethal injection executions is extremely meager and contains no detail regarding procedures, qualifications or training standards.

23. This Court should review all aspects of the procedures and practices including, for example, what review is made of the inmate's medical records and condition, how the drugs are stored, mixed and prepared, how the IV lines are sited, how the drugs are injected, how much of the drug is drawn up as opposed to actually used, the qualifications and technical expertise of execution team members and their training, the physical layout of

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the execution chamber, how the inmate's conscious state is monitored, and what contingency plans are in place for complications that arise or for last minute stays of execution.

DATED this 14th day of October, 2008.

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Exhibit 1

CURRICULUM VITAE

Michael J. Souter M.B., Ch.B., F.R.C.A.

Personal Data:

Born:	April 1st 1961, Inverness, Scotland, UK. British Citizen.

Education:

1979-1984	University of Edinburgh, Scotland, UK	M.B., Ch.B.

Postgraduate Training:

08/01/1984 -01/31/1985	Borders General Hospital, Galashiels, Scotland, UK	House Physician	General Medicine
02/01/1985 -07/31/1985	West Cornwall Hospital, Penzance, Cornwall, UK	House Surgeon	General Surgery
08/01/1985 -07/31/1988	Royal Navy	Medical Officer	General Medical and Sea Service
02/01/1989 -01/31/1990	Western General Hospital, Edinburgh, Scotland, UK	Senior House Officer	Anaesthesia
02/01/1990 -07/31/1990	Eastern General Hospital, Edinburgh, Scotland, UK	Senior House Officer	Anaesthesia
08/01/1990 -02/28/1991	St John's Hospital, Howden, Livingston, Scotland, UK	Senior House Officer	Anaesthesia
03/01/1991 -09/30/1991	Royal Infirmary of Edinburgh, Edinburgh, Scotland, UK	Senior House Officer(3)	Anaesthesia
10/01/1991 -02/28/1993	Royal Infirmary of Edinburgh, Edinburgh, Scotland, UK	Career Registrar	Anaesthesia
03/01/1993 -05/30/1995	Western General Hospital, University of Edinburgh, Scotland, UK	Fellowship	Clinical Neurosciences
06/01/1995 -02/28/1996	Royal Infirmary of Edinburgh, Edinburgh, Scotland, UK	Senior Registrar	Anaesthesia
03/01/1996 -10/30/1997	Royal Infirmary of Edinburgh, University of Edinburgh, Edinburgh, Scotland, UK	Clinical Lecturer	Anaesthesia (Academic)

Faculty Positions Held:

05/01/1998 - 09/30/2001	Senior Lecturer, Dept of Anaesthesia, University of Glasgow, Glasgow, Scotland, UK
10/23/2001 to date	Associate Professor, Dept of Anesthesiology, University of Washington, Seattle, USA
07/01/2004 to date	Associate Professor (Adjunct), Dept of Neurosurgery, University of Washington, Seattle, USA

Hospital Positions Held:

01/10/1997 - 09/30/2001	Consultant in Neuroanaesthesia and Neurointensive Care, Institute of Neurological Sciences Southern General Hospital, Glasgow, Scotland, UK
10/23/2001 to date	Attending Physician in Anesthesiology & Critical Care, Harborview Medical Center, 325 Ninth Avenue, Seattle, USA
07/01/2004 to date	Medical Co-Director, Neurosurgical Critical Care, Harborview Medical Center, 325 Ninth Avenue, Seattle, USA

Other Positions Held:

01/01/08 - to date	Medical Advisor, LifeCenter NorthWest, Bellevue, Washington

Board Certification:

1992	Fellowship of Royal College of Anaesthesia, United Kingdom
1997	Certificate of Completion of Specialist Training, General Medical Council, United Kingdom

Current License to Practice:

1985 to date	Full Registration, General Medical Council of Great Britain
2001 to date	State of Washington , Physician - Teaching & Research

Professional organisations:

1990 -	Association of Anaesthetists of Great Britain & Ireland
1991 - 2001	Scottish Society of Anaesthetists
1992 -	Royal College of Anaesthetists, UK
1994 - 2001	Scottish Intensive Care Society
1995 -	Anaesthesia Research Society of Great Britain (Full Member)
1995 -1997	Neuroanaesthesia Society of Great Britain & N. Ireland (Associate)
1995 - 2001	Society for Computing and Technology in Anaesthesia, UK
1997 -	Society of Neurosurgical Anesthesia & Critical Care
1997 -	Neuroanaesthesia Society of Great Britain & N. Ireland (Full Member)
2001 -	Washington State Society of Anesthesiologists
2001 -	American Society of Anesthesiologists
2002 -	Society of Critical Care Medicine
2002 -	International Anesthesia Research Society
2003 -	Neurocritical Care Society
2005 -	Society for Technology in Anesthesia
2007 -	Society for Education in Anesthesia

Teaching Responsibilities:

1996 - 97	University of Edinburgh, Undergraduate Anaesthesia, 'Critical Care' Course management – 30%.
1996 - 97	University of Edinburgh, Postgraduate Anaesthesia, Primary FRCA Course, 'Neurophysiology', 'Central Venous Access', 'Practical Regional Anaesthesia'
1996 - 97	Royal Infirmary of Edinburgh, Anaesthesia Assistants Course, 'Physiological Monitoring'
1997 - 2001	Institute of Neurological Sciences, Postgraduate Teaching and CME, Neuroanaesthesia - 'Intensive Care Management of Neurotrauma', Neurointensive Care - 'ICU Nutrition', 'Neuromuscular disorders', 'Percutaneous Tracheostomy', 'Subarachnoid haemorrhage', 'Jugular Oximetry & CBF' Neurointensive Care topics – 100%
1997 - 2001	University of Glasgow, Postgraduate Anaesthesia, Primary FRCA Course, 'Head Injury and Principles of Neuroanaesthesia', 'Functional Divisions of the Brain and Senses'

1998 - 2001	University of Glasgow, B.Sc Neurosciences Course, 'Monitoring of Brain Injury'
1998 -2001	Scottish Intensive Care Society, Intensive Care Medicine Course, 'Head Injury Management'
2000 - 2001	University of Glasgow, Postgraduate Anaesthesia, Scottish Final FRCA Course, 'Monitoring in Neuroanaesthesia', 'Neurological Critical Care' Course module organiser - 15%
2000 - 2001	University of Glasgow, Undergraduate Anaesthesia, Special Study Module, 'Evidence Based Intensive Care of Head Injury' Course organiser - 100%
2002 -	University of Washington, Dept of Anesthesiology, Resident Education Seminars 'Controlled Hypothermia' – 100%
2002 -	Neurosurgical Critical Care Service, Harborview Medical Center, 'Resident Didactics' – 30%
2003 - 2006	University of Washington, Dept of Anesthesiology, Resident Education Seminars 'Neurophysiology' – 100%
2004 -	University of Washington, Dept of Anesthesiology, Resident Education Seminars 'Anesthesia for Intracranial Aneurysms' – 100%

Special Local Responsibilities:

1998 - 2001	Hospital Nutrition Committee , for Neuroanaesthesia, Southern General Hospital
2000 - 2001	Steering Group of Institute of Neurological Sciences Consultants Committee, Southern General Hospital
2000 - 2001	West of Scotland Postgraduate Medical Education Board - Anaesthesia Subcommittee, for Neuroanaesthesia
2000 - 2001	Anaesthesia/ICU/HDU Subcommittee of Maxillofacial/Neurosciences Development Group, South Glasgow University Hospitals NHS Trust.
2002 –	Critical Care Advisory Committee, Harborview Medical Center, Seattle, Washington for Neurocritical Care Service.
2002 - 2004	Faculty Council on University Facilities and Services, University Of Washington, Seattle.
2002 -	Chairman, Anesthesiology Equipment Committee, Harborview Medical Center, Seattle, Washington.
2003 -	Clinical Competency Committee, Anesthesia Residency Program, University Of Washington, Seattle.
2003 -	Academic Affairs Committee, Anesthesia Residency Program, University Of Washington, Seattle.
2004 -	Ethics Committee, Harborview Medical Center, Seattle, Washington.
2004 - 2006	Academic Senate, University of Washington, Seattle. (Anesthesiology Representative)
2005 -	Critical Care Subcommittee for review of Brain Death Guidelines, Harborview Medical Center, Seattle, Washington. Now leading this subcommittee.

2006-	Health Technology Assessment Clinical Committee, Washington State
2006-	Lead Clinician, Anesthesia Electronic Record Implementation Project(HMC), Dept of Anesthesiology, University of Washington.
2007-	Chair, Clinical Competency Committee, Anesthesia Residency Program, University Of Washington, Seattle.
2008-	Web Initiatives Oversight Committee, University of Washington, Seattle.

Special National Responsibilities:

2003 - 2004	Experimental Neurosciences Subcommittee, for American Society of Anesthesiologists
2005 - 2007	Critical Care Subcommittee, for American Society of Anesthesiologists
2006 -	Examinations Committee, Diploma Board in Neurocritical Care, United Council for Neurologic Subspecialties.
2006 -	Novation Anesthesia & Critical Care Services Council, for University Health Consortium
2007 -	Neurocritical Care Subcommittee, for Society of Neurosurgical Anesthesia and Critical Care.
2007 -	Executive Committee, MOnITоR Trials Group (Monitoring Organ donors to Improve Transplantation Results)
2008 -	Medical Director's Council, Association of Organ Procurement Organisations.

Research Funding:

Pharmacia Travelling Fellowship Royal College of Anaesthetists , Presentation at 5th International Congress of Cardiac, Thoracic and Vascular Anaesthesia, Istanbul, Turkey. (September 1995) £900 ($1350)

Scottish Health Education & Research Trust, 'Does cerebral hypoxia only occur following coronary artery bypass grafting surgery ?', 1997-98, £65 000 ($97 500)
Jointly with Dr RP Alston, Prof. I Deary and Dr PJD Andrews.

Wellcome Trust, 'Is post-operative cerebral hypoperfusion following cardiac surgery associated with brain damage ?' 1998-2000, £140 000 ($210 000)
Jointly with Dr RP Alston, Prof. I Deary and Dr PJD Andrews.

Editorial Responsibilities:

Ad Hoc Reviewer	British Journal of Anaesthesia
	Neurocritical Care
	Anesthesia & Analgesia
	Respiratory Care

BIBLIOGRAPHY

Manuscripts in Refereed Journals:

1. Souter, M.J., Andrews, P.J.D.: A review of jugular venous oximetry. Intensive Care World 13:32-38, 1996.

2. Souter, M.J., Andrews, P.J.D.: Validation of the Edslab dual lumen oximetry catheter for continuous monitoring of jugular bulb oxygen saturation after severe head injury. Br J Anaesth 76:744-746, 1996.

3. McKeating, E.G., Monjardino, J.R., Signorini, D.F., Souter, M.J., Andrews, P.J.D.: A comparison of the Invos 3100 and the Critikon 2020 near-infrared spectrophotometers as monitors of cerebral oxygenation. Anaesthesia 52:136-140, 1997.

4. Souter, M.J., Signorini, D.F.: Meta-analysis: Greater than the sum of its parts? Br J Anaesth 79:420-421, 1997.

5. Souter, M.J., Andrews, P.J.D., Piper, I.R., Miller, J.D.: Effects of alfentanil on cerebral haemodynamics in an experimental model of traumatic brain injury. Br J Anaesth 79:97-102, 1997.

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14. Souter, M.J., Andrews, P.J., Pereirinha, M.R., Signorini, D.F., Jones, P.A., Miller, J.D.: Delayed intracranial hypertension: relationship to leukocyte count. Crit Care Med 27:177-181, 1999.

15. Alston, R.P., Souter, M.J.: Cerebral sequelae of cardiac surgery. Current Opinion in Critical Care 6:92-97, 2000.

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Book Chapters:

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3. Souter M.J., Lam A.M. Neurocritical Care. In: Miller R.D. ed. Miller's Anesthesia 7th Edition. Churchill Livingstone (In Press)

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1. Andrews P, Souter M.: Why the eagerness to condemn? Anaesthesia 48:1020, 1993.

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3. Alston RP, Deary IJ, Robson MJ, Andrews PJ, Souter MJ. Another example of regression to the mean (not). : Anesth Analg 2002 95:1823

4. Robson MJ, Alston RP, Andrews PJ, Wenham PR, Souter MJ, Deary IJ. Apolipoprotein E and neurocognitive outcome from coronary artery surgery J Neurol Neurosurg Psychiatry 2002 72:675-6

5. Deem S, Souter MJ. B-Aware: recall of intraoperative events.Lancet. 2004 364(9437):840

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6. Souter MJ, Piper IR, Jobb H, McGhee K. Paracetamol Induced Arterial Hypotension During Routine Neurointensive Care. *Journal of Neurosurgical Anesthesiology* 12, 159-159. 2000.

7. Vavilala MS., Suz P, Souter MJ, Muangman S, Lam AM. Pyrexia and Outcome in Severe Pediatric Traumatic Brain Injury, American Society of Anesthesiologists, Las Vegas, Nevada, USA, 2004

8. Rozet I, Souter MJ, Domino KB, Goodkin R, Lam AM. Dexmedetomidine Sedation for Awake Craniotomies, American Society of Anesthesiologists, Las Vegas, Nevada, USA, 2004

9. Souter MJ, Britz GW, Kincaid MS, Ghodke B, Lam AM. The Radiographic Validity of Transcranial Doppler Cerebral Blood Flow Measurement, Brain 05, Amsterdam, Netherlands, 2005 & American Society of Anesthesiologists, Atlanta, Georgia, USA, 2005

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12. Kincaid MS, Souter MJ, Bryan PD, Klein M, Lam AM. Somatosensory and Motor Evoked Potentials during Sevoflurane and Propofol Anesthesia. American Society of Anesthesiologists, San Francisco, USA, 2007.

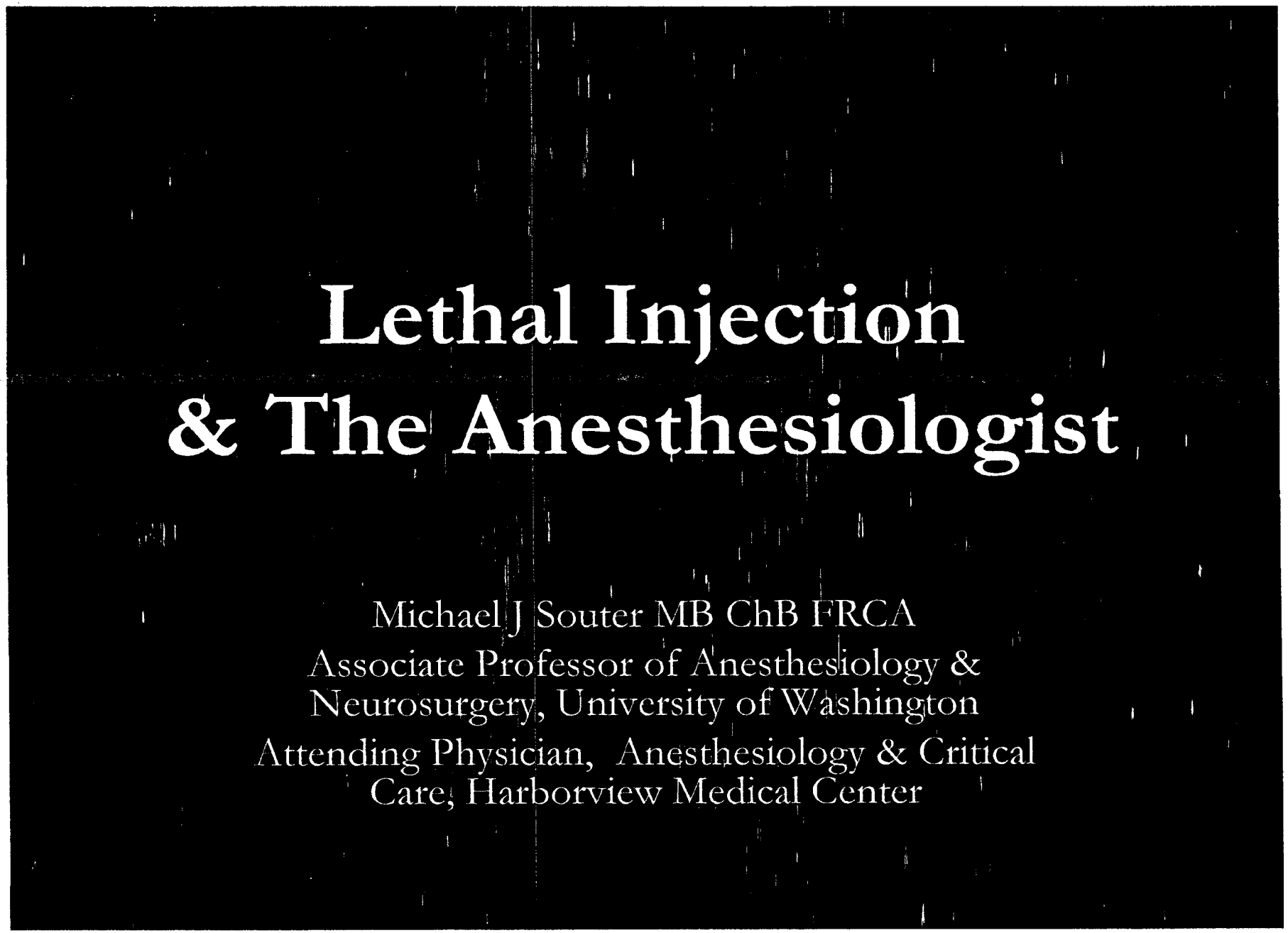
Other – Invited Lectures & Talks

1. Cerebral Blood Flow during Cardiac Surgery. Edinburgh Anaesthesia Festival, Edinburgh, Scotland - August 1996.

2. Immediate Care of Traumatic Brain Injury. Lakes & Borders Society of Anaesthetists, Carlisle, England - October 1996.

3. Brain Protection during Cardiopulmonary Bypass. European Society of Anaesthesiology, Lausanne, Switzerland - May 1997.
4. Measurement of Cerebral Physiological Function in Anaesthesia and Intensive Care. British Veterinary Anaesthesia Society, Edinburgh, Scotland - March 1998.
5. Secondary Neuronal Injury, Welsh Intensive Care Society, Portmeirion, Wales - June,1998.
6. Intensive Care of Subarachnoid Haemorrhage, Neuroanaesthesia Society of Great Britain & N. Ireland, Cambridge, England – March 2001.
7. Anesthetic Management of Traumatic Brain Injury, Washington State Society of Anesthesiologists, Seattle, USA – May 2003
8. Clinical Forum on Ethics, American Society of Anesthesiologists, Las Vegas, USA – October 2004
9. Clinical Forum on Ethics, American Society of Anesthesiologists, Atlanta, USA – October 2005
10. Post-operative Management of Aneurysm Patients, Advances in Stroke & Cerebrovascular Disease Management, University Of Washington – March 2007
11. Capital Medicine – Lethal Injection and the Medical Practitioner, Ethics Forum , Harborview Medical Center, Seattle, USA – January 2008.
12. Hypothermia for Spinal Cord Injury – Society for Critical Care Medicine Annual Congress, Honolulu, Hawaii, USA – February 2008.
13. Lethal Injection and the Anesthesiologist, Washington State Society of Anesthesiologists, Seattle, USA – March 2008.
14. Medical Management of Organ Donors – Neurology Grand Rounds, University of Washington, Seattle, USA – July 2008.
15. Blood pressure Management of Aneurysmal Subarachnoid Hemorrhage – Society of Neurosurgical Anesthesia & Critical Care, Orlando, USA – October 2008.
16. ASA Refresher Course Lecture – 'Traumatic Brain Injury – What Do I Need to Know ?' - American Society of Anesthesiologists, Orlando, USA – October 2008

Exhibit 2



Objectives

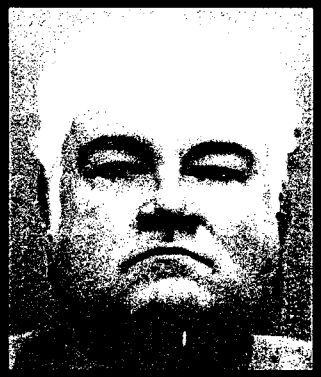
- History of the development of lethal injection
- Current status of lethal injection as capital punishment
- Problems in pharmacology & monitoring technology
- Medical ethics and judicial execution

What I am not going to do..

- Talk about the ethics of capital punishment
- Tell you that doctors never get involved in capital punishment
- Tell you how to administer lethal injection properly….

Lethal Injection

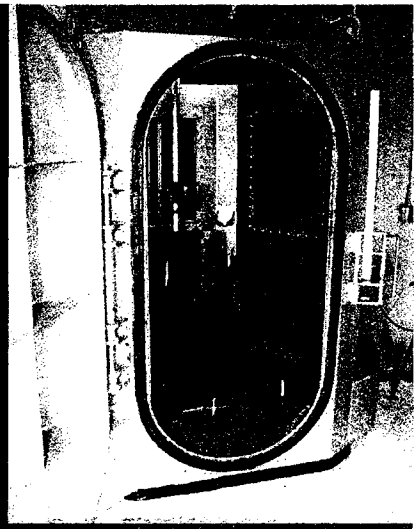
- Society would like capital punishment, if legislated for, to be swift, uncomplicated and trouble-free
- Hanging, gas chamber and electrocution intermittently associated with prolonged death and technical failure
- Lethal injection postulated as a scientific answer to technical and ethical concerns on administration
  - 'More humane'



The problem…

- Allen Lee Davis, broke into a house and murdered pregnant woman and her two daughters
  - Executed by electric chair - July 8, 1999, Florida State Prison. Burns on scalp and forehead, on superpubic and right upper medial thigh region, and behind the right knee
  - Photographs posted on web in later judge's dissent on capital issues – crashed Florida Supreme Court web site
- Jesse Tafero, executed on May 4, 1990, for murder of Highway Patrol officer.
  - Smoke and foot-long flames observed spurting from his head.
  - Controversy compounded by considerable doubt as to his guilt.
- Electrocution remains only method in Nebraska
- Possible in Alabama, Arkansas, Florida, Illinois, Kentucky, Oklahoma, South Carolina, Tennessee, Virginia.

Gas chamber



- Donald Harding – executed in gas chamber April 6, 1992, for multiple murders. Took 11 minutes to die, in 'gruesome' circumstances.
- Generated considerable public comment in Arizona, which allowed choice of lethal injection thereafter.
- Gas chamber still possible means of execution in Arizona, California, Wyoming, Maryland and Missouri

A Solution…?

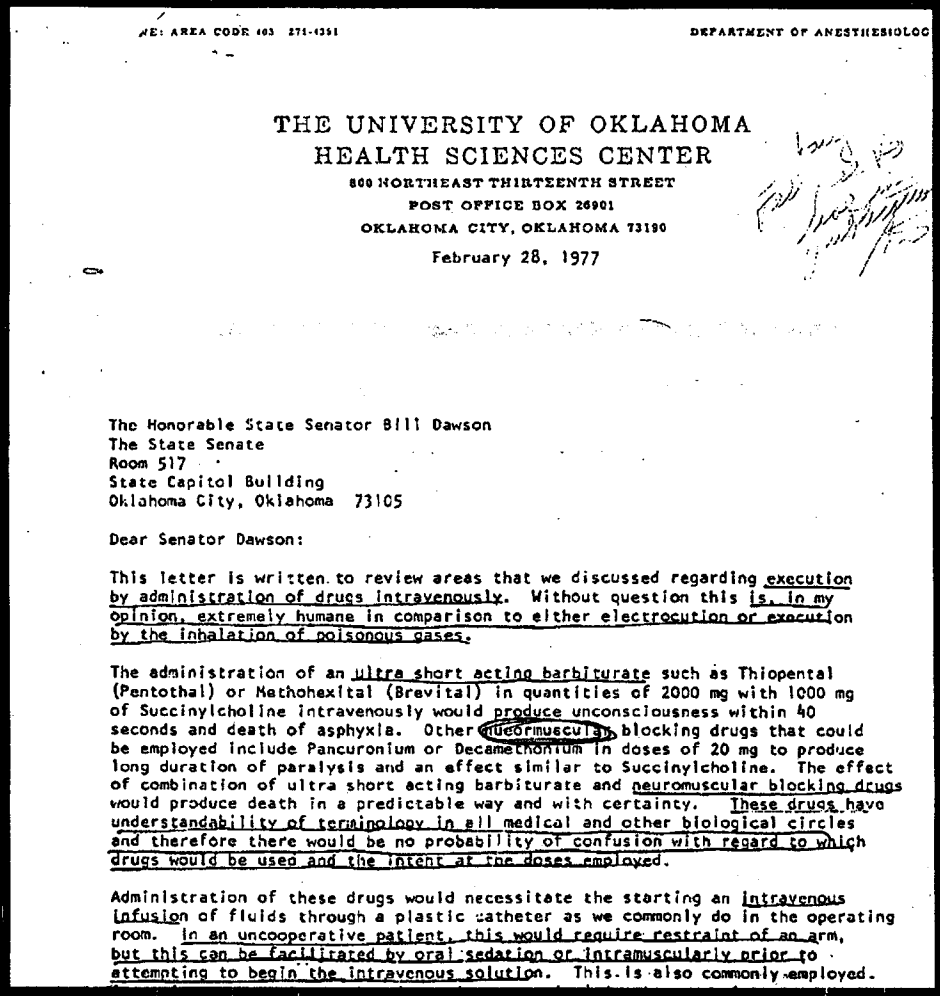
- Lethal injection considered as potential method as early as 1888
  - Rejected by New York Governor's Commission
  - medical profession's objection that general public would link medicine with death
- UK Royal Commission on Capital Punishment dismissed lethal injection in 1953
  - 5 yr study of the death penalty process
  - Concluded injection was no better than hanging –
  - significant input from British Medical Association, Association of Anaesthetists, Prison Medical Officers
  - Likely to be significant problems in those with anatomical abnormalities / difficult veins
  - Required medical skill

May 1977, Oklahoma

- First state to adopt lethal injection
- Initiated by Oklahoma State politicians.
  - Senator Bill Dawson & Representative Bill Wiseman.
  - Tried various medical societies – unsuccessfully
- A. Jay Chapman, M.D., then Chief Medical Exami consulted by Wiseman.
  - 'expert in dead bodies, but not in getting them that way'
  - Proposed "An intravenous saline drip …to which shall be introduced a lethal injection consisting of an ultra-short-acting barbiturate in combination with a chemical paralytic."
  - Formed basis of initial bill
- Dr. Chapman later added potassium chloride, as "Doctors know potassium chloride is lethal. Why does it matter why I chose it?"

Specifics

- Dawson then independently consulted Stanley Deutsch, M.D., head of Oklahoma Medical School's Anesthesiology Department, over the telephone, to solicit specific written recommendations for intravenous execution.
- They never actually met.
- Deutsch responded with "an ultra short acting barbiturate such as thiopental" in combination with a "neuromuscular blocking drug", suggesting succinylcholine or pancuronium
- "this is a rapid, pleasant way of producing unconsciousness"
- The doses suggested are around 3-5 times that required for anesthesia



AREA CODE 405 271-4351 DEPARTMENT OF ANESTHESIOLOG

THE UNIVERSITY OF OKLAHOMA
HEALTH SCIENCES CENTER
800 NORTHEAST THIRTEENTH STREET
POST OFFICE BOX 26901
OKLAHOMA CITY, OKLAHOMA 73190

February 28, 1977

The Honorable State Senator Bill Dawson
The State Senate
Room 517
State Capitol Building
Oklahoma City, Oklahoma 73105

Dear Senator Dawson:

This letter is written to review areas that we discussed regarding execution by administration of drugs intravenously. Without question this is, in my opinion, extremely humane in comparison to either electrocution or execution by the inhalation of poisonous gases.

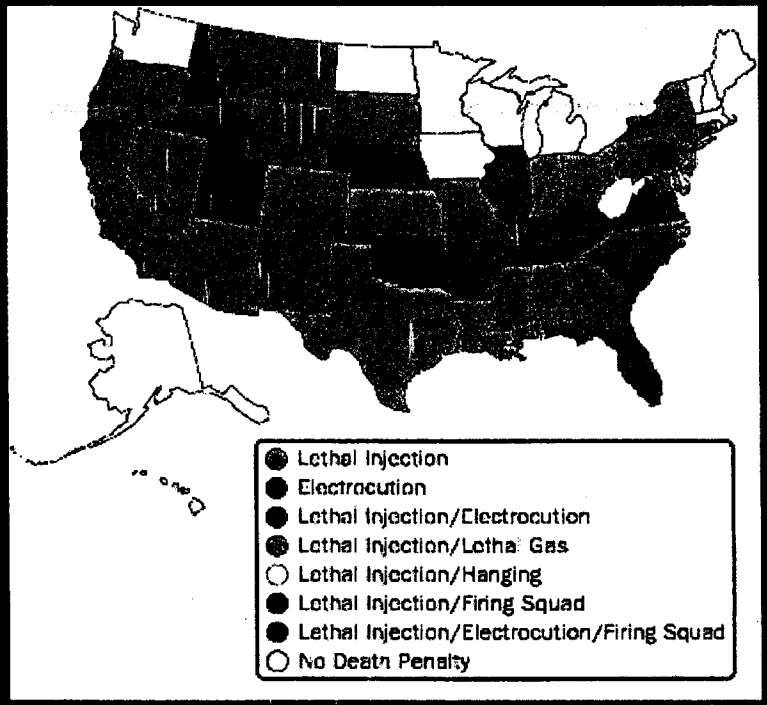
The administration of an ultra short acting barbiturate such as Thiopental (Pentothal) or Methohexital (Brevital) in quantities of 2000 mg with 1000 mg of Succinylcholine intravenously would produce unconsciousness within 40 seconds and death of asphyxia. Other neuromuscular blocking drugs that could be employed include Pancuronium or Decamethonium in doses of 20 mg to produce long duration of paralysis and an effect similar to Succinylcholine. The effect of combination of ultra short acting barbiturate and neuromuscular blocking drugs would produce death in a predictable way and with certainty. These drugs have understandability of terminology in all medical and other biological circles and therefore there would be no probability of confusion with regard to which drugs would be used and the intent at the doses employed.

Administration of these drugs would necessitate the starting an intravenous infusion of fluids through a plastic catheter as we commonly do in the operating room. In an uncooperative patient, this would require restraint of an arm, but this can be facilitated by oral sedation or intramuscularly prior to attempting to begin the intravenous solution. This is also commonly employed.

Irony

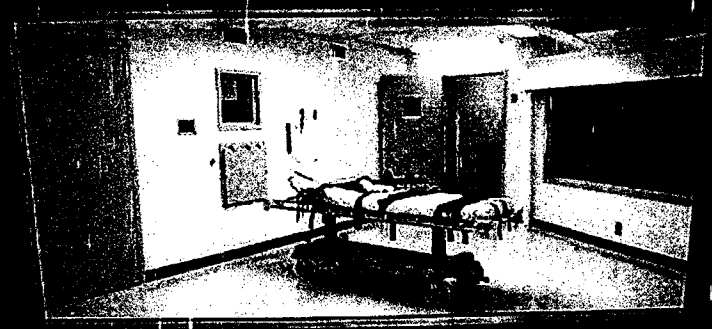
- Texas rapidly copied Oklahoma's procedure and legislation, and became first state to use lethal injection on 12/7/1982, in executing Charlie Brooks for the kidnap/murder of a Fort Worth auto mechanic
- Some initial concerns appeared
  - "Dr. A. Jay Chapman, state medical examiner, said that if the death-dealing drug is not administered properly, the convict may not die and could be subjected to severe muscle pain."
    - (Daily Oklahoman, May 1977)

- 37 states with legislation enacting lethal injection

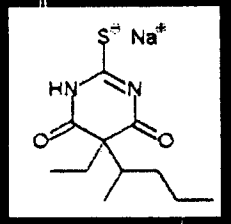


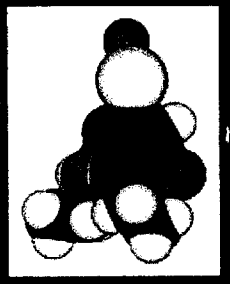
What actually happens

- Inmates taken through conventional stages of 'death watch', including last meal
- Secured to gurney.
- Depending on local protocol, IV's located before moving to execution room.
- Most located within execution room, with curtains drawn back subsequently

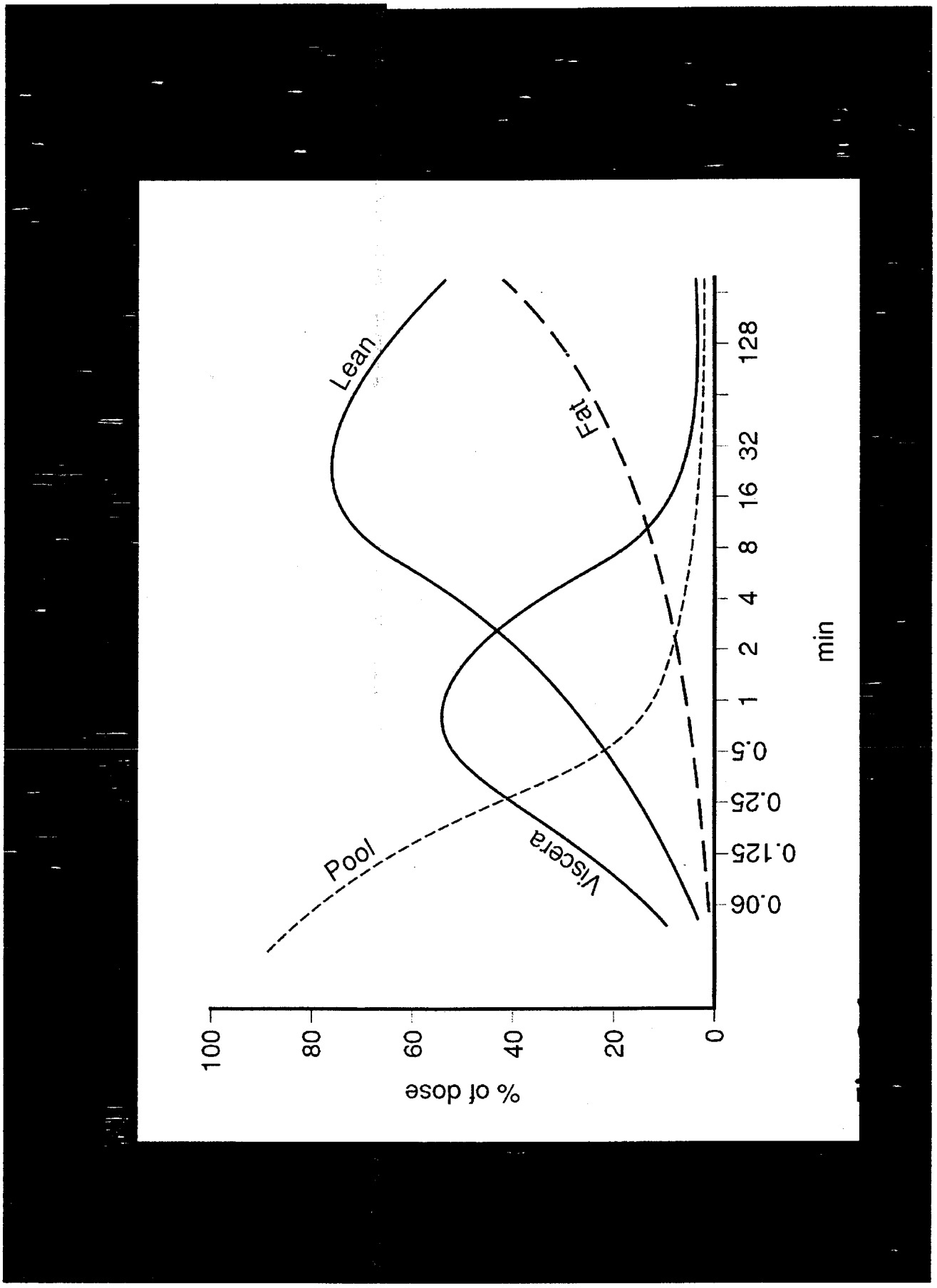


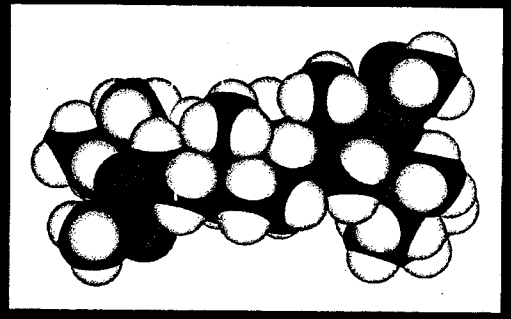
Drugs used



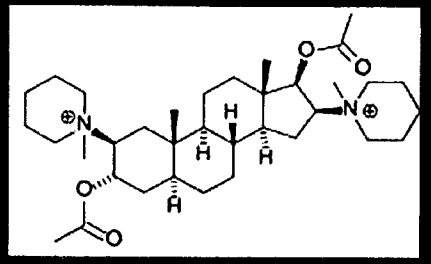


- Sodium Thiopental
  - Barbiturate, in use since 1934.
  - Famously associated with increasing deaths at Pearl Harbor.
  - rapidly reaches the brain and causes unconsciousness within 30–45 seconds, with 3-5 mg/kg dose
  - Wears off within 10-30 minutes
    - half-life of 4.6-8.5 minutes by rapid distribution to other body tissues
    - This distribution is increased in extreme anxiety/excitement
    - Previous drug use can increase doses required
  - high alkaline pH (10 to 11) - if it enters tissues outside vein, causes pain, sloughing and necrosis


Lean
Fat
Pool
Viscera
% of dose
0
20
40
60
80
100
0.06
0.125
0.25
0.5
1
2
4
8
16
32
128
min

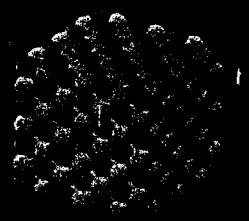


Pancuronium



- Pancuronium chloride - neuromuscular blocker
  - Disengages the chemical signalling between nerves and the muscles they control.
  - No sedative or analgesic effects
    - Side effects include moderately raised heart rate, blood pressure, excessive salivation, rashes, flushing and sweating.
    - Onset in 90-120 seconds in doses of 0.1 mg/kg
    - Effect lasts for 100-120 minutes
    - Acidifies and precipitates thiopental – flocculation – occluding IV lines
  - Is lethal on its own, as an asphyxiant - stops breathing
  - Paralysis may disguise consciousness

Potassium Chloride



- Potassium essential for rhythmicity of the heart
- Low levels cause fast arrhythmias
- High levels slow heart rate and can stop the heart altogether in sufficient dosage
- Local effects – concentrated solutions cause local pain, venous irritation, thrombosis and phlebitis . This can progress to sloughing and ulceration.
- Systemic side effects include nausea, vomiting, abdominal pain and diarrhea.
- Lowest published lethal dose is 20 mg/kg in man when taken orally. IV dose is considerably smaller and depends on rate of administration, mixing in blood etc.
- Dose in lethal injection usually 100 mEq = 3908 mg
- Acidic and precipitates with thiopental (Brooks, Texas)

Procedure

- Establish intravenous access at two sites
- Administer thiopental – doses between 2 and 5 g IV
  - 5- 10 times anesthesia dose
  - Volume of 60 -120 mls
- Administer saline flush (50 mls)
- Administer pancuronium – 50 mg IV
  - 5 times large adult anesthesia dose
  - Volume of 50 mls
- Administer saline flush (50 mls)
- Administer potassium chloride (100 – 200 mEq) IV
  - 2 - 4 times the oral lethal dose
  - Volume of 50- 100 mls
- Administer saline flush (50 mls)

Practicalities

- This adds up to 360- 470 mls of IV fluid
- Goes through around 8 feet of tubing to get to inmate
- Hagen – Poiseuille Equation
- Takes time & force

$$\phi = \frac{\pi R^4 \Delta P}{8 \eta L}$$

….Don't believe Johnny Weissmuller…..

Possible and real problems

- Chiefly related to conduct of the procedure and administration
- Adequate intravenous access for volume of fluid
- IV cannula
  - Chances of successful placement vary inversely with catheter size
  - Previous drug abuse
  - Anxiety / fear
    - Newton, May 2007, Ohio – 2 hours
    - High, Nov 2001, Georgia – 69 minutes (physician placed neck line)
    - Rector , March 1992, Arkansas – 50 minutes
  - Excessive force of injection can dislodge cannula and/or 'blow' vein, with infusions leaking to tissues
    - Landry, Dec 1988, Texas – cannula dislodged and sprayed drugs over room. Resited.
    - Clark, May 2006, Ohio – cannula dislodged into tissues
    - Diaz, Dec 2006, Florida – drugs leaked into tissues. Required 2nd administration of drugs.
  - Cannula obstructed
    - Gacy , May 1994, Illinois – flocculation in cannula. Replaced.
    - Foster, May 1995, Missouri – gasping & convulsing after 7 minutes. Straps obstructed drugs flowing into arm – only some of the drugs got in – after 20 minutes, medical examiner intervened to loosen straps and execution proceeded.

Research Letters

Inadequate anaesthesia in lethal injection for execution

Lancet 2005; 365: 1412–14
Leonidas G Koniaris, Teresa A Zimmers, David A Lubarsky, Jonathan P Sheldon
See Editorial page 1361

- autopsy toxicology results from 49 executions
  - Arizona, Georgia, North Carolina, and South Carolina
  - Samples taken 12-24 hours after death
  - Some argument but weight of opinion is that Thiopental actually increases in concentration after death (leaves organs) – thus concentrations may be overestimates

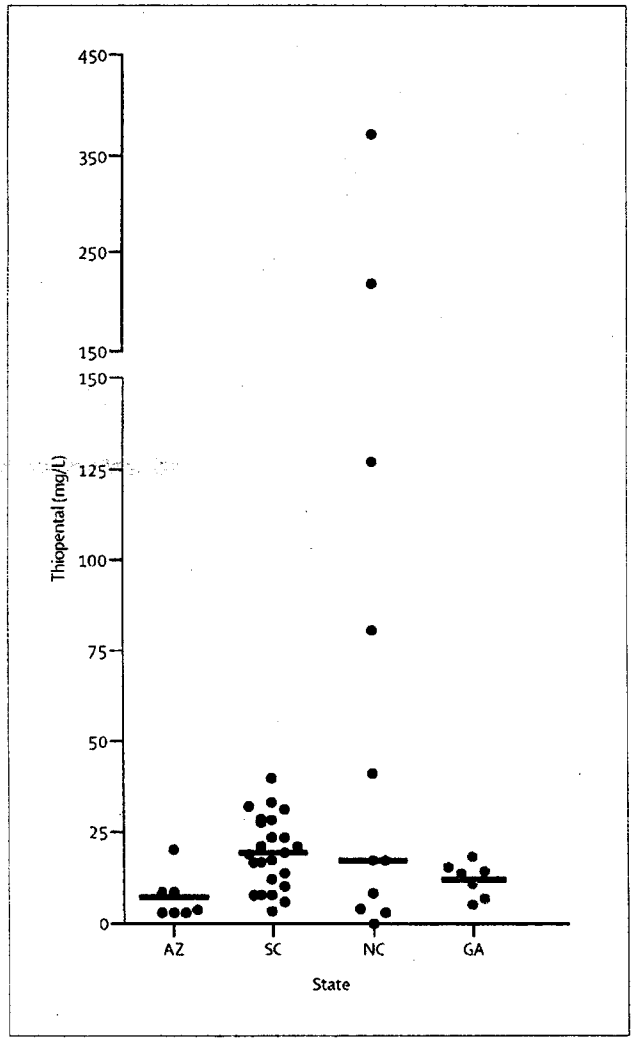


Figure 1: **Individual post-mortem thiopental concentrations in blood by state**

Lines show medians. Note different scales. GA sampled several sites in five individuals; the highest values are shown. GA values were reported as plus or minus 25%. AZ and SC did not report site of blood sampling. NC results were each from a single site, including subclavian artery, jugular vein, femoral vein, or vena cava.

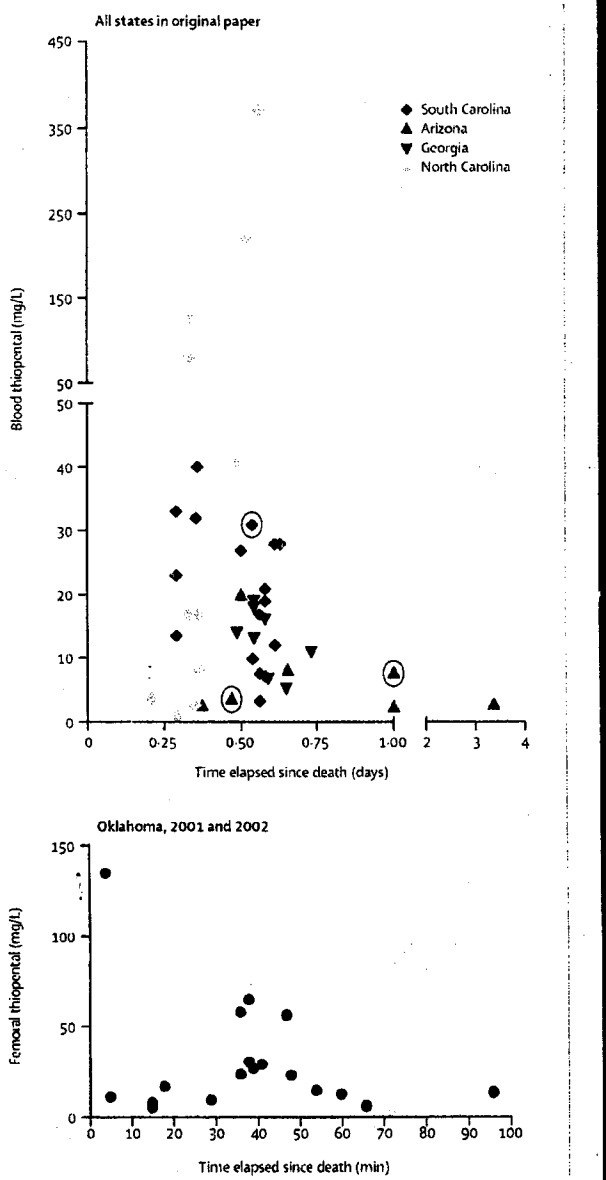


Figure: **Thiopental concentrations in blood plotted against sampling time**

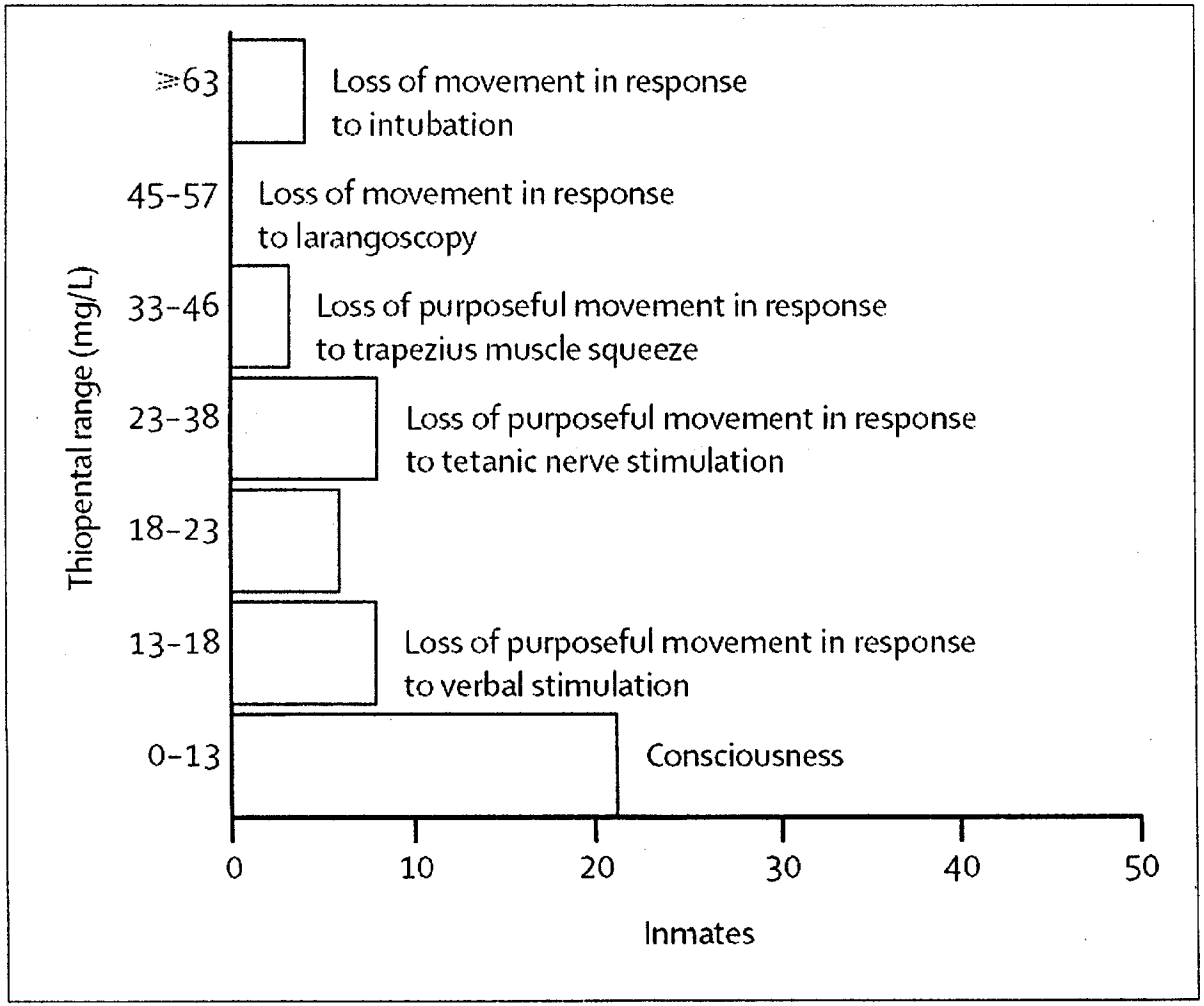


Figure 2: **Number of executed inmates with post-mortem thiopental concentrations within range for indicated clinical endpoint**
Ranges are 95% CI of the Cp50 for the stimuli.

Veterinary Euthanasia

- Ronald Reagan (then Governor of California) advocated lethal injection in 1973, comparing it to "putting a horse to sleep"
- euthanasia of animals is a highly regulated and evolving process, based on strict guidelines periodically revised and modernized by the American Veterinary Medicine Association (AVMA)
- 19 states prohibit the use of neuromuscular agents, or mandate sedative only euthanasia
  - so as not to disguise inadequate anesthesia, awareness and pain on injection of KCl.

California - Judge Fogel

- US District Court – Northern California
- Heard request for stay of execution of Michael Morales
- San Quentin execution logs submitted as evidence & reviewed
  - Concern for inmates being conscious during injection of pancuronium or potassium chloride
    - drugs that the parties agreed would cause an unconstitutional level of pain if injected into a conscious person.
    - (possible evidence for 6 of 11 inmates executed by lethal injection)
- Unusual intervention of the judiciary into executive
  - Use single drug – thiopental or
  - Obtain services of professional licensed to give intravenous drugs, to administer the agents and ensure unconsciousness,
  - and conduct a thorough review of the lethal injection protocol

The next day

- State - retained "two anesthesiologists who would attend Plaintiff's execution pursuant to the terms of the order"
- This satisfied the court, finding that "the anesthesiologists designated by Defendants are qualified professionals who will use their professional judgment not merely to observe the execution but to *ensure* that Plaintiff is and remains unconscious"
- It appeared settled….

"disconnect between the expectations"

- "For reasons that remain somewhat unclear"
  - State "apparently had told the anesthesiologists that the anesthesiologists merely would have to observe the execution, while Defendants' counsel represented to the Court that the anesthesiologists would ensure that Plaintiff would remain unconscious after he was injected with sodium thiopental."
- BUT – when anesthesiologists actually read the court opinion, 3-4 hours before execution.
  - Declined for reasons of medical ethics.
- Several hours of 'tense discussion' and 'telephonic hearings' followed. Including "training of the anesthesiologists"
- State then said they would use only thiopental
- Judge agreed if they used direct injection into cannula, by licensed individual. State could not do so.

Case 5:06-cv-00219-JF Document 290, **UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, SAN JOSE DIVISION**

Evidentiary hearing

- Detailed review of execution procedure together with on-site testimony at San Quentin State Prison, California
  - Examined the equipment and facilities used during executions
  - partial testimony from leader of execution team.
  - voluminous written testimony, including depositions from experts and present and former execution team members
- Identified a number of procedural problems

Findings

- "the amount of sodium thiopental to be given to the condemned person pursuant to OP 770 is sufficient to cause virtually all persons to become unconscious or even to cease breathing within one minute."
- "However, the record in this case…. is replete with evidence that in actual practice OP 770 does not function as intended."

"Critical deficiencies"

- Inconsistent and unreliable screening of execution team members.
  - Drug smuggling, PTSD
- Lack of training, supervision, and oversight of the execution team
  - "uniformly have no knowledge of the nature or properties of the drugs that are used or the risks or potential problems associated with the procedure"
- Inconsistent and unreliable record-keeping
  - Amounts of thiopental left in syringe
  - ECG printed on plain paper – no rate computation possible
- Improper mixing, preparation, and administration of sodium thiopental
- Inadequate lighting, overcrowded conditions, and poorly designed facilities – cannot observe inmates face

Recommendations to State

- "Given that the State is taking a human life, the pervasive lack of professionalism in the implementation of OP 770 at the very least is deeply disturbing"
  - Evidence from Dr Robert C Singler (State expert witness) on execution of Robert Lee Massie
    - "Massie well may have been awake when he was injected with potassium chloride"
- But he concluded that
  - the three drugs , if given correctly would satisfy constitutional requirements for avoidance of pain, while inducing death
  - The protocol problems were fixable , given executive leadership
  - Suggested 'thorough review' of protocol, including better monitoring & record-keeping and re-examine use & requirement for three drugs
- California has now released exhaustively detailed protocol for lethal injection, using all 3 drugs.

Key points

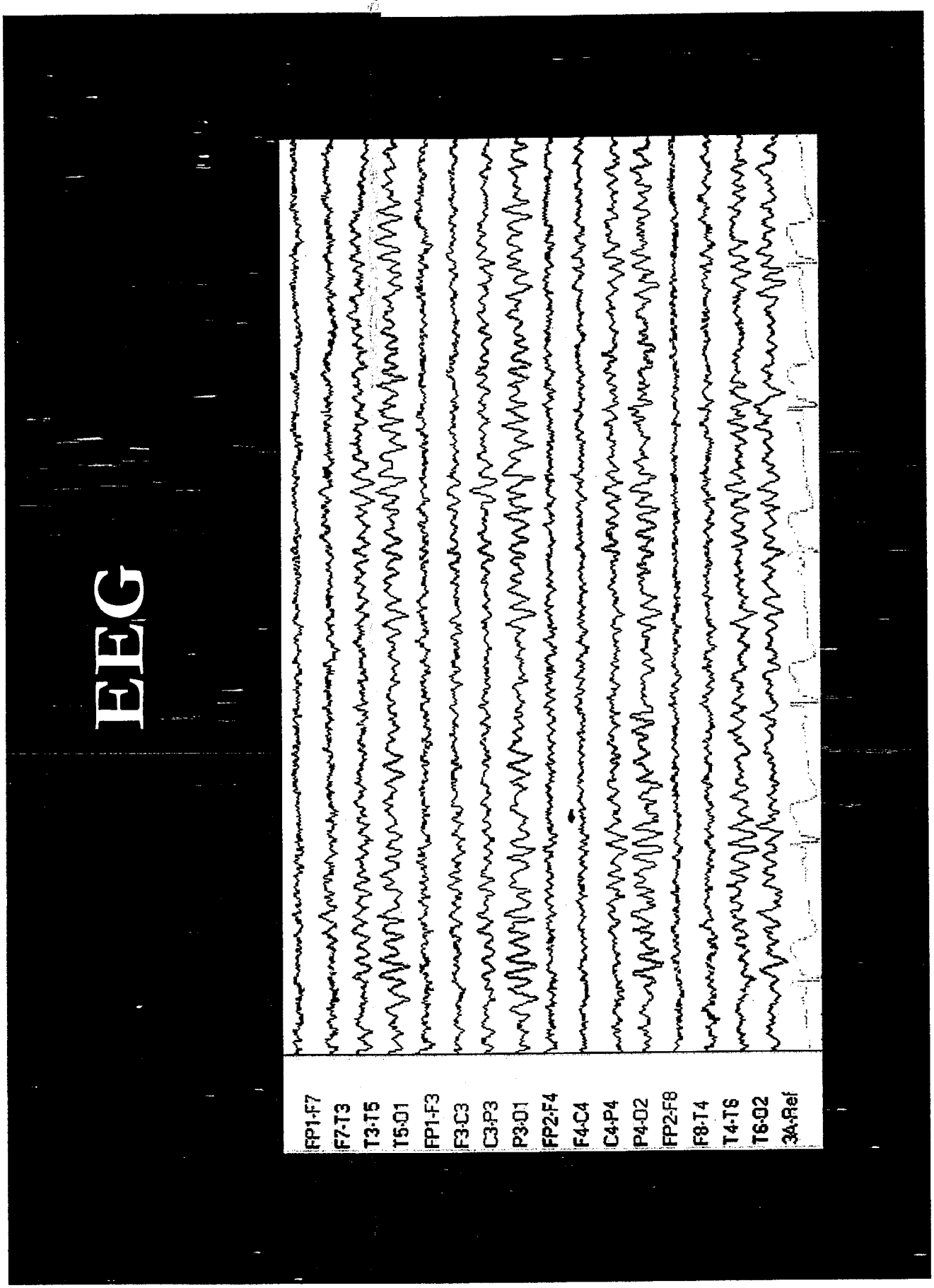
- Ignorance of technical requirements for drug administration
- Ignorance of the precise effects of the drugs
- Ignorance of risks and complications
- Ignorance of ethical position of physicians

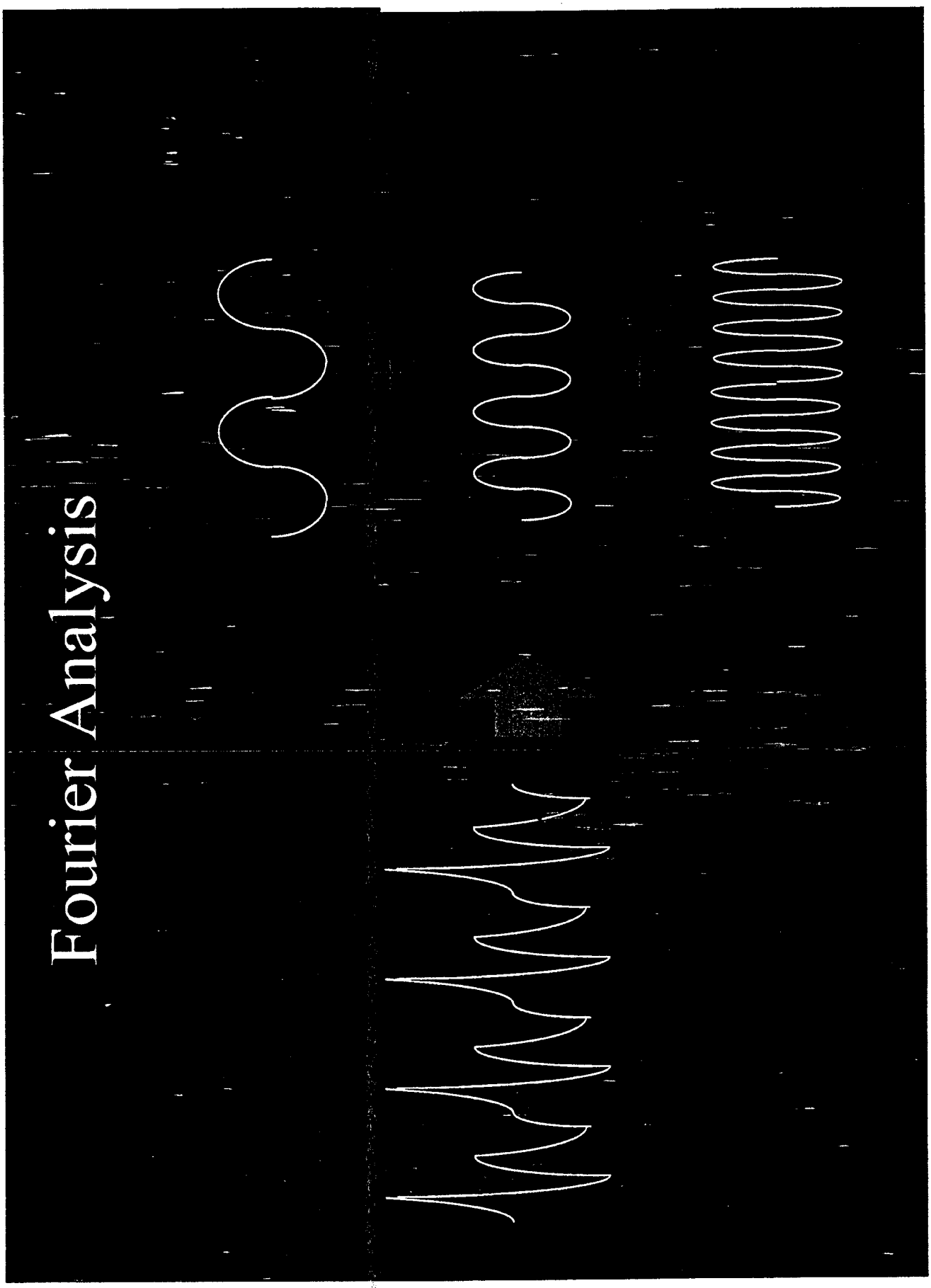
Meanwhile …..in North Carolina

- Wlillie Brown Jr, appealed on 8th amendment basis to North Carolina district court
- Court found that the state needed to revise its protocol to ensure the inmate was unconscious, using medically trained personnel.
- Department of Corrections bought a BIS monitor, used to monitor conscious level during anesthesia
- Controversial – evidence that the machine on its own does not constitute adequate evidence of anesthetic depth
- California tried to buy it unsuccessfully
- North Carolina stated on its order form that the machine would be used to monitor inmates recovering from surgeries.

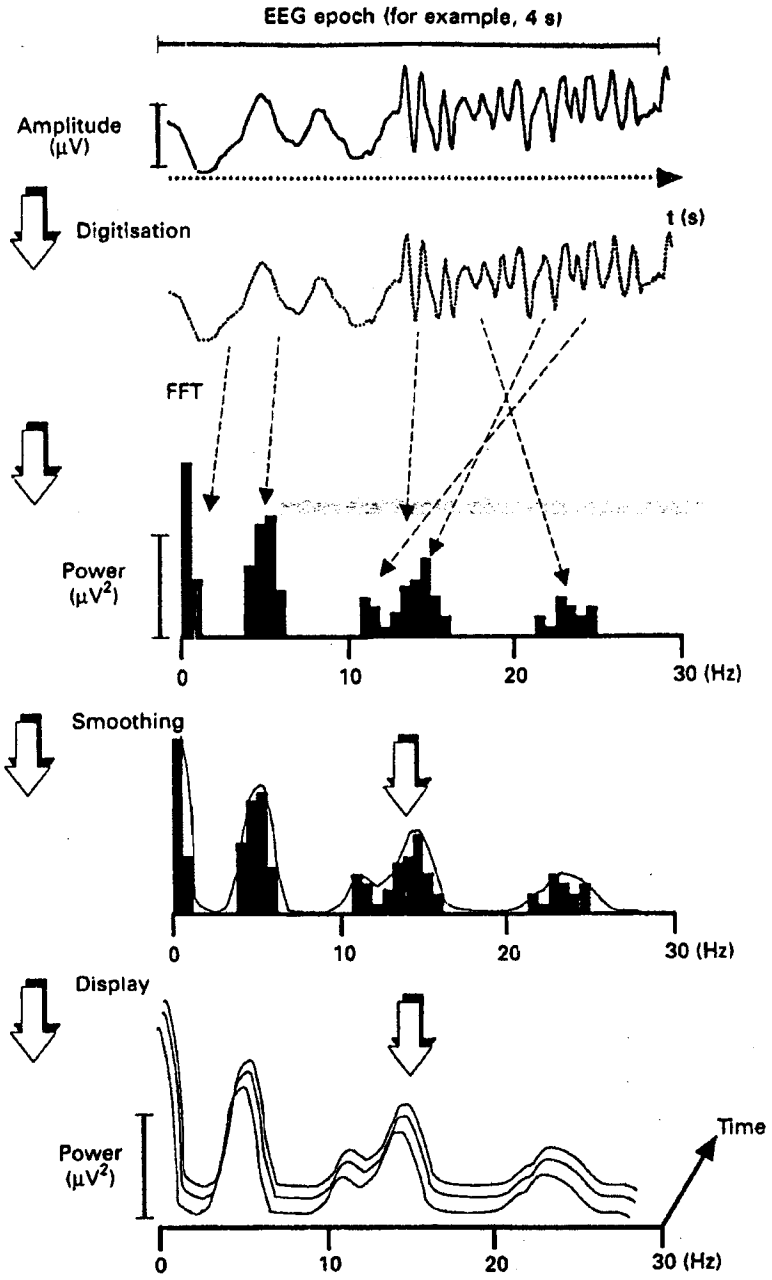
What is the BIS ?

- Bispectral index monitor
- processes brain electrical activity ie the EEG into discrete frequencies
- Calculates derived indices of the EEG
- Empirically derived calibration of these indices to clinical observation & monitored drug levels, correlating to 'anesthetic depth'
- Judged by the American Society of Anesthesiologists (ASA) to be possibly useful, but NOT A STANDARD OF CARE

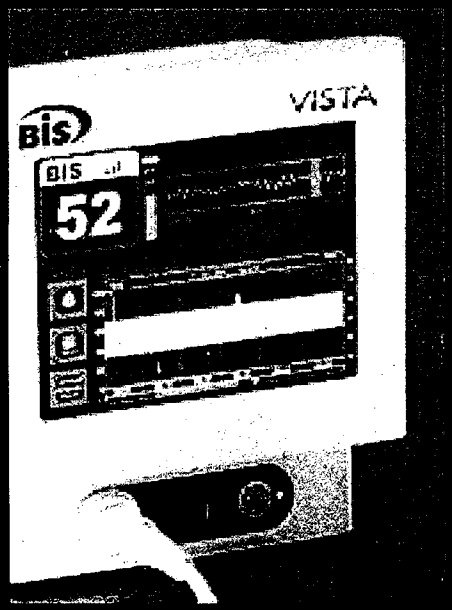

EEG
FP1-F7
F7-T3
T3-T5
T5-O1
FP1-F3
F3-C3
C3-P3
P3-O1
FP2-F4
F4-C4
C4-P4
P4-O2
FP2-F8
F8-T4
T4-T6
T6-O2
34-Ref


Fourier Analysis

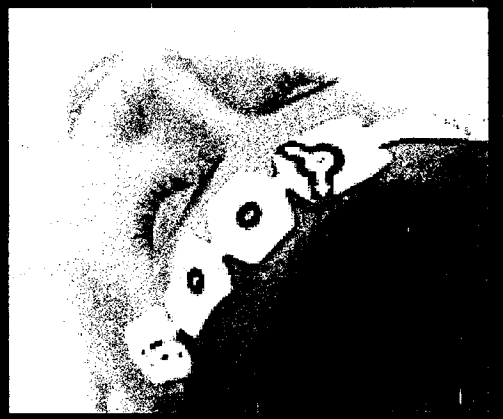
- Component frequencies
  - phase and power relationships
  - expressed as mathematical quotients
- Algorithm derived from empiric observations
  - Recordings from over 10000 anesthetics
  - EEG library matched with behavioral correlates and blood drug levels
  - Proprietary equation of quotients - predicting wakefulness, expressed on 1-100 scale

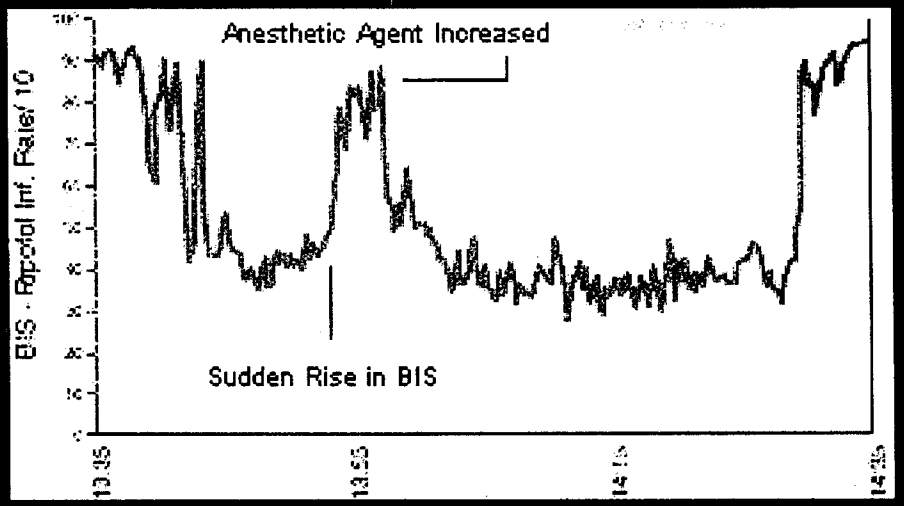


Bispectral index



Sedation is < 80
Anesthesia defined as < 60





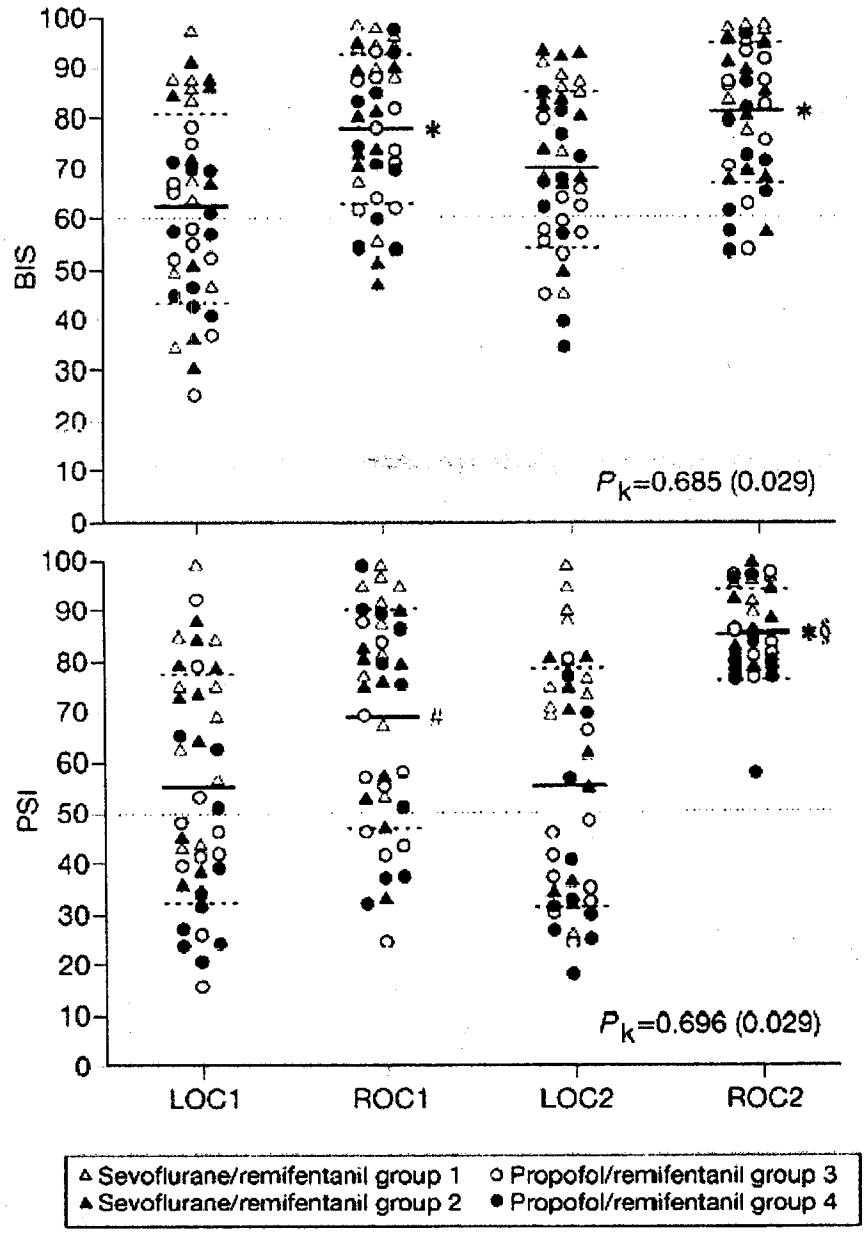
Awareness..?

- Schneider et al. Br J Anaesth 2003; 91: 329-35
- 40 patients – started drug infusions
- Asked to squeeze hand every 30s – when stopped responding = LOC1
- After LOC, stopped drugs , hand squeezing returned = ROC1
- Restarted drug infusions again till hand squeezing– LOC2
- Surgery.
- End of surgery, drugs stopped, hand squeezing – ROC2

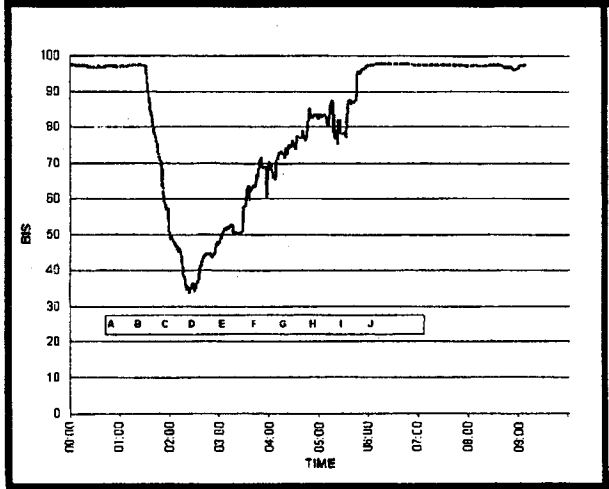
Significant variability in range at which loss of consciousness and return of ability to obey commands returned.

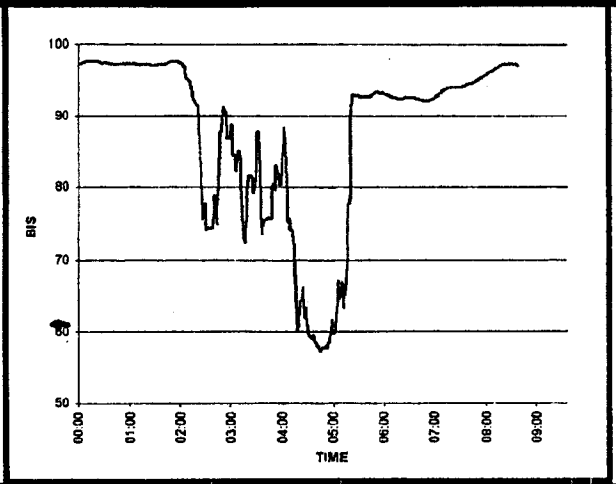
Huge crossover of values despite differing mean values

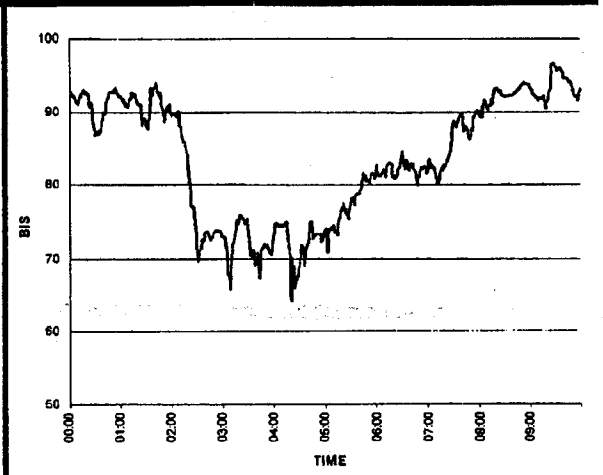
Schneider et al. Br J Anaesth 2003; 91: 329-35



The BIS and neuromuscular paralysis







- Volunteers
  - Isolated forearm from drug injection
  - Paralysed with short acting drug, succinylcholine
  - Dropped BIS values to anesthetic range and below

Messner et al. Anesth Analg 2003;97:488 –91

State plan – 1

- "the BIS monitor can be employed and operated and values obtained, recorded, and interpreted by any health care providers experienced in using electrocardiogram (ECG) monitors, such as registered nurses, paramedics, and emergency medical technicians (EMT's)."
- The manufacturer disagreed, as did the ASA

State Plan - 2

- State submitted to the court that they intended to "use a licensed registered nurse and a licensed physician to monitor the level of plaintiffs consciousness."
- Using the BIS , "if he remains conscious at that time, they will be able to bring about the injection of additional sodium pentothal until plaintiff is rendered fully unconscious."
- North Carolina filed against state medical board
  - seeking to prevent the board from taking disciplinary actions against those physicians who chose to participate in executions.

Yet More Disconnection

- Obi Umesi, a North Carolina M.D., admitted in deposition that he had attended at least two of the state's latest executions
  - For ethical reasons, failed to monitor the inmate's consciousness in both.
  - He also said the Department of Corrections had never informed him of the order requiring such monitoring.

Again

- State demonstrated
  - Ignorance of ethical position of physicians
  - Limited understanding of monitoring technology
  - ‘ Technological fix’ is inadequate in the setting of deficient procedural integrity

Missouri

- Michael Taylor appealed on similar basis in February 2006.
  - Missouri courts made similar requirements for the presence of a board-certified anesthesiologist
  - Arose when disturbing information came to light on the training and abilities of a surgeon , Dr Alan Doerhoff ,
  - He had been involved in formulating the execution procedure in Missouri, and in facilitating performance of executions since mid 1990's.

Dr Alan Doerhoff

- He had been given free rein in modifying procedure
- No written procedures ever seen by him, prior to doing so.
- No written procedures in state.
- 20 malpractice suits – banned from 2 hospitals
- Dyslexia' responsible for dosage errors & memory problems – *'but it's not medically crucial in the type of work I do as a surgeon'*
- Idiosyncratic decision to half thiopental doses when manufacturers halved size of vials
- Inserted central lines into the groin
- Court banned him from participating in future procedures

Missouri at the moment

- U.S. District Judge Fernando Gaitan Jr. had made request for an anesthesiologist.
- State officials had contacted 298 anesthesiologists in Missouri and southern Illinois, and found none willing to participate in executions
- Requirements revised 'to permit a physician with training in the application and administration of anesthesia to either mix the chemicals or to oversee the mixing of the chemicals for lethal injections'
- Court was still unhappy with this, citing persistent uncertainty on the procedural adequacy of the state protocol.
- On June 4th 2007, a three-judge panel of the 8th U.S. Circuit Court of Appeals found "no evidence to indicate that any of the last six inmates executed suffered any unnecessary pain," and reversed Judge Gaitan's ruling

Ethical position of physicians

- In 1980, after introduction of lethal injection – the American Medical Association (AMA) passed a resolution in 1980 against physician participation as a violation of core medical ethics.
- It affirmed that ban in detail in its 1992 Code of Medical Ethics.
  - Article 2.06 states, "A physician, as a member of a profession dedicated to preserving life when there is hope of doing so, should not be a participant in a legally authorized execution. Physician participation in execution is defined generally as actions which would fall into one or more of the following categories:
  - (1) an action which would directly cause the death of the condemned;
  - (2) an action which would assist, supervise, or contribute to the ability of another individual to directly cause the death of the condemned;
  - (3) an action which could automatically cause an execution to be carried out on a condemned prisoner."
  - Updated 1994,1996,1999, 2000.

- The code of ethics for the Society of Correctional Physicians states:
  - "The correctional health professional shall not be involved in any aspect of execution of the death penalty."
- The American Nurses Association (ANA)
  - Ethics and Human Rights Position Statements:
  - "The ANA is strongly opposed to nurse participation in capital punishment. Participation in executions is viewed as contrary to the fundamental goals and ethical traditions of the profession."
- The National Association of Emergency Medical Technicians position paper says :
  - "NAEMT is strongly opposed to participation in capital punishment by an EMT, Paramedic or other emergency medical professional. Participation in executions is viewed as contrary to the fundamental goals and ethical obligations of emergency medical services."

Primum non nocere

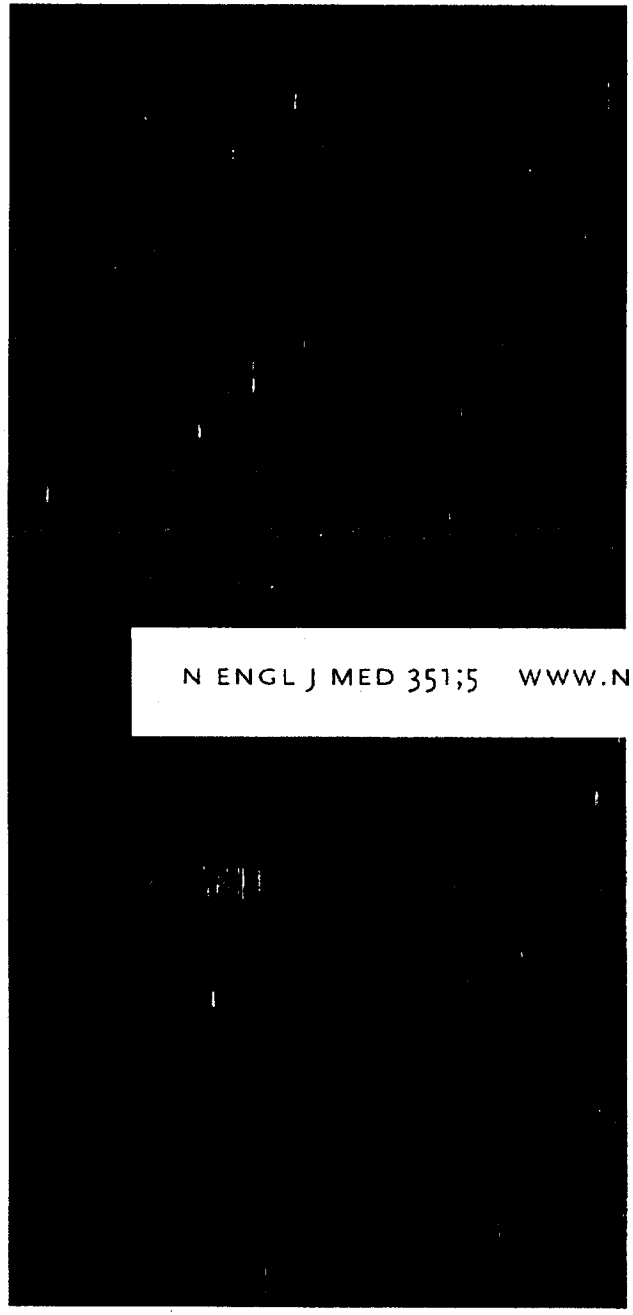
- 'Firstly – do no harm'
  - Attributed to Galen paraphrasing Hippocrates
  - actually originated from Thomas Sydenham (1624–1689)
  - It has become one of the core tenets of medicine
- Hippocratic oath says
  - "I will neither give a deadly drug to anybody if asked for it, nor will I make a suggestion to this effect."

Doctors who killed for the state...

Josef Mengele

Herta Oberheuser

Carl Clauberg



N ENGL J MED 351;5 WWW.NEJM.ORG JULY 29, 2004

PERSPECTIVE

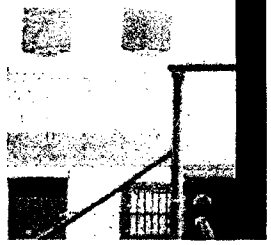
HUMAN RIGHTS

Doctors and Torture

Robert Jay Lifton, M.D.

There is increasing evidence that U.S. doctors, nurses, and medics have been complicit in torture and other illegal procedures in Iraq, Afghanistan, and Guantanamo Bay. Such medical complicity suggests still another disturbing dimension of this broadening scandal.

We know that medical personnel have failed to report to higher authorities wounds that were clearly caused by torture and that they have neglected to take steps to interrupt this torture. In addition, they have turned over prisoners' medical records to interrogators who could use them to exploit the prisoners' weaknesses or vulnerabilities. We have not yet learned the extent of medical involvement in delaying and possibly falsifying the death certificates of prisoners who have been killed by torturers.



- Surgeon & writer

The NEW ENGLAND JOURNAL of MEDICINE

MARCH 23, 2006

When Law and Ethics Collide — Why Physicians Participate in Executions

Atul Gawande, M.D., M.P.H.

- Interviewed 4 physicians & 1 nurse under conditions of anonymity – collectively helped with 45 executions
- 'The role…crept up on them'

Reasons

- "only helping with monitoring"
- "the sentence was society's order"
- "If the doctors and nurses are removed, I don't think [lethal injections] could be competently or predictably done."
- "I think that if I had to face someone I loved being put to death, I would want that done by lethal injection, and I would want to know that it is done competently."
- "This is an end-of-life issue, just as with any other terminal disease. It just happens that it involves a legal process instead of a medical process."
- One agreed to be identified – Dr Carlo Musso, Georgia – "didn't want to seem as if he was hiding anything"

Where does it end…?

- Red Cross and Medecins sans Frontieres
- Both became involved in treating amputations carried out under Sharia.
- Local physicians in Afghanistan have amputated hands in a stadium of on-lookers
- Similar events occurred in Hussein's Iraq
  - army deserters had ears amputated
- Physicians
  - complying with their 'religious duty'
  - 'Who would do it if we did not?'

Euthanasia & Suicide

- Legal in Holland and Belgium
- Quasi-legal in Switzerland
  - Physician assisted suicide
  - Similar to Oregon
- Drugs employed in euthanasia are…
  - Sodium Thiopental
  - Pancuronium

Back to Lethal Injection

- ASA had aligned itself with AMA's stance on execution & physician involvement.
- June'2006 - Orin Guidry MD – then president of ASA, released general letter to membership, as a consequence of court actions
- He identified and was concerned at the increasing legislative requisition of anesthesia presence.
- He was also concerned about using technology in the hands of non-anesthesia personnel, rather than procedural integrity.
- He reiterated ASA position on physician non-participation in executions
  - "Lethal injection was not anesthesiology's idea…. The legal system has painted itself into this corner and it is not our obligation to get it out. .."
  - "My advice would be to be well informed on the subject and steer clear."

Indignation..?

- "The execution of a condemned criminal lies far outside the medical sphere. A physician's participation in that execution does nothing to promote the moral community of medicine."
- "Indeed, such participation offends the sense of community by prostituting medical knowledge and skills to serve the purposes of the state and its criminal justice system…Medicine is at heart a profession of care, compassion, and healing. Physician-assisted capital punishment does not encompass these virtues"

Robert Truog, Professor of Medical Ethics and Anesthesiology (Pediatrics), Harvard Medical School, Senior Associate in Critical Care Medicine at Children's Hospital, Boston.

Where does that leave us ?

- Who will the State ask to perform the task of execution?
- To prescribe drugs
  - State pharmacists – no ethical proscription
- To administer drugs
  - Paramedics/EMT's – despite position paper
    - main group employed to date
  - Nurses
    - Participation in execution is against nursing ethics as well
    - More ex-nurses than ex-physicians…
- The Courts
  - will probably continue to mandate the involvement of physicians, despite physician reluctance
- Both may continue to explore the implications of monitoring technology….

Is there a doctor…?

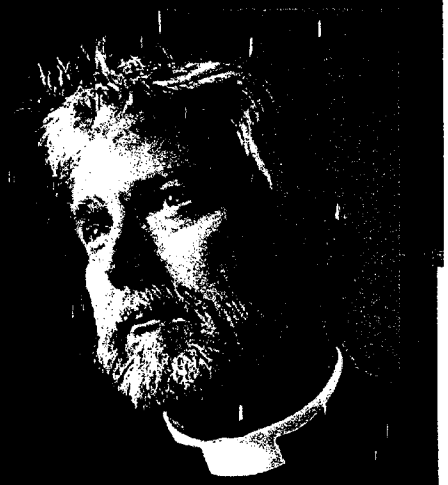
- States requiring the presence and participation of physicians in capital punishment procedures are:
  - Colorado; Florida; Georgia; Idaho; Louisiana; Mississippi; Nevada; North Carolina; New Hampshire; New Jersey; NewMexico; Oklahoma; Oregon; South Dakota; Virginia; Washington; and Wyoming.
- States allowing physician presence upon discretion are:
  - Alabama; Arizona; Arkansas; California; Connecticut; Delaware; Indiana; Kansas; Missouri; Montana; Nebraska; New York; Ohio; Pennsylvania; South Carolina; Tennessee; Texas; and Utah.
- Illinois and Kentucky forbid physician participation or presence in criminal executions.

Summary

- There are inherent risks in procedure that can leave inmates aware and in pain
- There have been probable cases of this
- States are altering protocols to suit
- Many want to incorporate physician support
- Physicians are torn between
  - wanting to alleviate suffering arising from lack of competency from
  - Not wanting to support the 'medicalization' of execution, nor be involved in the process
- Several state legislatures are challenging the ability of medical bodies to set ethical standards on involvement in execution
- Society and the legislature chose capital punishment
- It is their responsibility to fix the present situation

The perspective of time…

- Bill Wiseman
  - Now an Episcopalian priest
  - "I'm sorry for what I did. I hope someday to offset it by helping us realize that capital punishment is wrong and self-destructive."
- Dr. A. Jay Chapman
  - Still defends his decision to be involved
  - "I never knew we would have complete idiots injecting these drugs . . . which we seem to have"



Articles of Interest (1)

- So Long as They Die : Lethal Injections in the United States. http://hrw.org/reports/2006/us0406/
- STATE OF CALIFORNIA SAN QUENTIN OPERATIONAL PROCEDURE NUMBER 0-770 - EXECUTION BY LETHAL INJECTION. http://www.cdcr.ca.gov/Communications/docs/ReportToCourt.pdf
- The Lethal Injection Quagmire: How Medical Participation and Procedures Have Changed the Face of Executions. Deborah W. Denno. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=896570
- Florida Governor's Commission on Administration of Lethal Injection: Final Report With Findings and Recommendations. http://www.law.berkeley.edu/clinics/dpclinic/Lethal%20Injection%20Documents/Florida/lethalinjectionfinalreport.pdf

Articles of Interest (2)

- When Law and Ethics Collide — Why Physicians Participate in Executions. Atul Gawande, M.D., M.P.H. *N Engl J Med* 354;12 www.nejm.org March 23, 2006
- Inadequate anaesthesia in lethal injection for execution. Leonidas G Koniaris, Teresa A Zimmers, David A Lubarsky, Jonathan P Sheldon. *Lancet* 2005; 365: 1412–14
- Conflict Of Duty: Capital Punishment Regulations And AMA Medical Ethics. Christopher J. Levy. *The Journal of Legal Medicine,* 2005 26:261–274.
- Morales v. Tilton. Case 5:06-cv-00219-JF Document 290 12/15/2006. http://www.deathpenaltyinfo.org/CalifLethalInjection.pdf
- Capital Punishment in Washington State http://www.doc.wa.gov/capitalpunishment/

Exhibit 3

STATE OF WASHINGTON DEPARTMENT OF CORRECTIONS	APPLICABILITY: PRISON		
	REVISION DATE: 6/21/07	PAGE NUMBER: 1 of 12	NUMBER: DOC 490.200
POLICY	TITLE: **CAPITAL PUNISHMENT**		

REVIEW/REVISION HISTORY:

Effective: 9/3/93
Revised: 6/15/98
Revised: 8/10/01
Revised: 6/21/07

SUMMARY OF REVISION/REVIEW:

Major changes. Read carefully.

APPROVED:

Hw. Clarke

HAROLD W. CLARKE, Secretary
Department of Corrections

5/11/07
Date Signed

STATE OF WASHINGTON DEPARTMENT OF CORRECTIONS	APPLICABILITY PRISON		
	REVISION DATE 6/21/07	PAGE NUMBER 2 of 12	NUMBER DOC 490.200
POLICY	TITLE **CAPITAL PUNISHMENT**		

REFERENCES:

DOC 100.100 is hereby incorporated into this policy; RCW 10.95.160-190; WAC 137-48-050

POLICY:

I. The Department has established procedures governing capital punishment to meet the requirements of RCW 10.95.160-190. These procedures set forth security requirements associated with an inmate subject to the death penalty; the protocol for the conduct of an execution; the care provided the inmate, during the time a valid Death Warrant is in force; and, defines the method of execution by lethal injection or hanging.

II. The Secretary of the Department designates the Prison Deputy Secretary to coordinate:

A. The responsibilities of the Superintendent of the Washington State Penitentiary (WSP), and

B. A review of the procedures and all operational decisions in carrying out the execution as well as the legal status of the Death Warrant.

DIRECTIVE:

I. Inmate Subject to the Death Penalty (ISDP) Housing

A. Upon receipt of an ISDP and prior to the receipt of a Death Warrant::

1. All male ISDPs will be housed in a single cell located in a segregated area of the facility.

2. Female ISDPs will be housed in a segregated area of the Washington Corrections Center for Women (WCCW). Prior to the execution date, the female ISDP will be transported to WSP for housing and implementation of the execution.

II. Pre-Execution Procedure

A. Consistent with RCW 10.95.190, a log will be maintained in the Superintendent's Office with the Death Warrant.

B. Responsibilities to be assigned are listed in the Execution Procedures and Assignments Checklist (Attachment 1).

C. Only staff assigned by the Superintendent will be in attendance at the execution. No facility staff will be required to participate in any part of the execution procedure.

STATE OF WASHINGTON DEPARTMENT OF CORRECTIONS	APPLICABILITY PRISON		
	REVISION DATE 6/21/07	PAGE NUMBER 3 of 12	NUMBER DOC 490.200
POLICY	TITLE **CAPITAL PUNISHMENT**		

III. Notification to Inmate Subject to the Death Penalty (ISDP)

A. After receiving confirmation of a valid Death Warrant , the Superintendent will designate an Associate Superintendent to personally interview the ISDP regarding procedures relating to the implementation of the death penalty.

B. The Associate Superintendent will provide the ISDP with a written summary of privileges to include mail, visits, telephone usage, and available religious services. In addition, the following will be covered:

1. The ISDP will be informed of the date of the execution.

2. The ISDP will be informed that the punishment of death will be lethal injection.

   a. The ISDP may elect hanging as an alternate means of execution.

   b. If the ISDP elects hanging, it must be stated in writing no later than 14 days prior to the execution date. The procedure to be utilized will be determined 14 days prior to the execution and the method cannot be changed after that date.

3. Mail privileges of an ISDP with an active Death Warrant will be handled in accordance with the following guidelines:

   a. The Mail Room Sergeant will be instructed, in writing, to forward all incoming mail to the designated Associate Superintendent who will screen and exclude any items which may threaten the order and security of the facility with regard to the ISDP.

      1) Mail intended to harass the ISDP will be considered a threat to the orderly operation of the facility and restricted according to WAC 137-48-050.

      2) Legal mail will not be read.

   b. The Mail Room Sergeant will maintain a log of all incoming and outgoing mail, noting the date and time of receipt and delivery. A separate log will be maintained for all legal mail.

4. All visits between the ISDP and authorized visitors will be no contact.

   a. The visiting privileges of an ISDP will be consistent with the visiting privileges of other inmates housed in the Intensive Management Unit.

b. One week prior to the execution, daily visits will be authorized in addition to attorney visits.

c. Twenty-four hours prior to the execution date, all visits and visitors require the approval/denial of the Superintendent.

d. After the ISDP is moved to the execution holding cell, visits will be restricted to approved clergy and the attorney of record.

5. The ISDP will have unlimited phone access during the daily yard period. Fourteen days prior to the execution date, an additional daily one-hour yard will be provided.

a. There will be no limit on the number or duration of calls to and from the attorney of record.

b. Only attorney calls will be authorized following the transfer of the ISDP to the execution holding cell.

IV. Media Relations

A. The Superintendent/designee will coordinate all requests for information concerning an execution.

1. Media access to the death chamber will be authorized by the Superintendent and coordinated by a designated staff.

B. Procedures will be established by the Superintendent for the selection of media witnesses as specified in the Witness Selection of this policy.

1. No audio equipment, electronic equipment, video equipment, cameras, telephones, recording or communication devices will be permitted in the Execution Chamber. Media witnesses will be subject to an electronic and pat search.

2. The only items that are allowed in the chamber are pens, pencils, and writing tablets supplied by the facility.

C. Requests from media representatives for access to the media center must be submitted in writing.

1. Media center access will not be permitted more than 3 hours prior to an execution.

D. Media access to a designated area of the facility parking lot will be permitted at a designated time the day prior to the execution.

E. Media will not be permitted to film or conduct interviews with facility staff without the prior authorization of the Superintendent/designee.

F. All normal facility security procedures will apply. Failure to comply with these procedures, Department policies, operational memorandums, or directions from authorized personnel may be cause for removal from the facility and/or facility grounds. The Superintendent may establish emergency rules and procedures.

V. Witness Selection

A. Not less than 20 days prior to an execution, judicial officers, law enforcement representatives, media representatives, representatives of the families of the victims, and representatives from the family of the defendant who wish to attend and witness the execution must submit a letter of request (e.g., application) to the Superintendent. The letter must designate the relationship to the ISDP and reason(s) for wishing to attend.

B. Not less than 15 days prior to the date of execution, the Superintendent will determine the total number of individuals, other than Department employees, who will be allowed to attend and witness the execution.

1. Witness determination will be made from the following categories:

a. No less than 5 media representatives, with consideration to be given to news organizations serving communities affected by the crimes or by the commission of the execution of the defendant,

b. Judicial officers,

c. Representatives of the families of victims,

d. Representatives from the family of the ISDP, and

e. Up to 2 law enforcement representatives. The chief law enforcement officer of the jurisdiction where the crime was committed shall designate the law enforcement representatives.

2. Once the list is composed, the Superintendent will serve the list on all parties who have submitted a letter (e.g., an application) to witness the execution.

C. Not less than 10 days prior to the execution, the Superintendent will file the witness list with the Superior Court from which the conviction and Death Warrant was issued. The witness list will be filed with a petition asking that the court enter an order certifying the list as a final order identifying the witnesses to attend the execution. The final order of the court certifying the witness list will not be entered less than 5 days after the filing of the petition.

D. Unless a show cause petition is filed with the Superior Court from which the conviction and Death Warrant was issued within 5 days of the filing of the Superintendent's petition, the Superintendent's list, by order of the Superior Court, will become final and no other party will have standing to challenge its appropriateness.

E. In no case may the Superintendent or the Superior Court order or allow more than 17 individuals, other than required staff, to witness a planned execution.

F. All witnesses must adhere to the facility's search and security provisions regarding the witnessing of an execution and may be subject to emergency rules and procedures.

VI. Execution Holding Cell

A. Prior to, but no sooner than 24 hours before the execution date, the ISDP will be moved to the execution holding cell.

B. The holding cell will contain:

1. Bedding that includes a mattress, 2 sheets, 3 blankets, a pillow, and a pillow case,

2. Personal hygiene items that include 2 towels, a washcloth, and a bar of soap,

3. Approved personal items and clothing that include underwear, facility clothing, legal materials, religious items, jewelry, or other personal items as requested by the ISDP and approved by the Superintendent, and

4. Other personal items as requested by the ISDP and approved by the Superintendent to be retained by holding cell staff and issued as requested by the ISDP.

C. A female ISDP may be housed in the WSP Intensive Management Unit prior to being moved to the execution holding cell.

1. Under no circumstances will the time, route, or method of transportation for the female ISDP be disclosed.

2. While housed at the Penitentiary, the female ISDP will be subject to the same regulations as a male ISDP.

D. Two correctional staff will be posted at the holding cell at all times and a complete log of activities will be maintained.

VII. Final Meal

A. At the meal period just prior to the time of execution, the ISDP will be allowed to provide his/her meal selection from a menu prepared and provided by the Food Service Manager. The Food Service Manager will ensure preparation and delivery of the meal to the ISDP.

VIII. Execution Preparation

A. The Superintendent will appoint individuals required to support the execution process.

1. No individual will be required to participate in any part of the execution procedure.

2. Briefings and rehearsals will be conducted as necessary to ensure adequate preparation for the administration of the death penalty.

B. Medical File Review

1. A review of the ISDP's medical file will be conducted for any unusual characteristic that might warrant deviation from this policy.

2. If needed, a physical examination of the ISDP will be conducted to determine any special problems (e.g., collapsed veins, obesity, deterioration of bone or muscular structure) that may affect the execution process. The inmate's height and weight will be measured during the examination.

3. Based upon review of the ISDP's medical file and the physical examination, the Superintendent may consult with appropriate experts to determine whether deviation from the policy is advisable to ensure a swift and humane death.

C. Crowd Control

1. The Superintendent will notify law enforcement agencies of the date of execution enabling them to prepare for any traffic and crowd control issues that may arise.

2. Prior to the execution, the Superintendent will hold briefings for local and state law enforcement agencies.

3. An area(s) will be designated for the general public.

4. The WSP Emergency Response Team (ERT) will provide crowd control for the protection of the WSP grounds.

   a. The ERT Commander(s) will be briefed by the Superintendent prior to the execution.

   b. In the event that protesters and/or onlookers gather, law enforcement assistance will be requested to direct them to the designated area.

IX. Execution Procedure

A. Lethal Injection

1. Lethal Injection Materials

   a. All tubing, syringes, saline solution, and other apparatus will be on site and verified no later than one week prior to the execution.

   b. The Superintendent will direct the acquisition of the appropriate quantities of lethal substances. These will be available and on site one week prior to the execution date.

   c. The Superintendent will ensure the security and continued verification of all materials.

2. Lethal Injection Table

   a. The Director of Health Services, in conjunction with the Plant Manager, will examine and verify that the lethal injection table is in working order with all restraints available.

3. Preparation of the Execution Area

a. The injection team will inspect the area designated for lethal injection and make any final recommendations to the Superintendent.

b. The injection team will assemble all necessary materials for transport to the Execution Chamber no less than one hour prior to the time of execution.

c. The injection team leader will secure the lethal substances and personally transport them to the Execution Chamber.

d. The solutions for injection will be prepared not more than 30 minutes prior to administration.

4. Execution Process

a. The Superintendent will direct that the ISDP be brought to the Execution Chamber. The escort team will place the ISDP on the lethal injection table and appropriately secure the ISDP to the table. The escort team will then leave the room.

b. The injection team will start a normal flow of saline. The injection team will ensure that a slow, normal saline flow is maintained.

c. The Superintendent will ask if there are any last words.

d. Upon notification from the Superintendent, the injection team will introduce the following lethal solutions, using a bolus injection into the tubing in the order specified:

1) 2 g thiopental sodium
2) 50 cc normal saline
3) 100 mg pancuronium bromide
4) 50 cc normal saline
5) 1.50 to 2.70 mEq/kg, based on body weight, potassium chloride (KCl)

e. Either line may be used for injection of solutions as required.

f. The injection team leader will signal the Superintendent that all of the solutions have been administered.

g. At a time deemed appropriate by the Superintendent, the curtains will be closed. The Superintendent will call for the physician to examine the body and make a pronouncement of death.

h. After the pronouncement of death, the injection team will remove the apparatus and saline solution and remain in the area until directed to leave.

i. Post-execution procedures will be followed.

B. Hanging

1. The gallows area trap door(s) and release mechanisms will be inspected for proper operation.

2. A determination of the proper amount of drop of the ISDP through the trap door will be made. The following standard military execution drop chart will be used:

WEIGHT (Pounds)	DROP DISTANCE
120	8'1"
125	7'10"
130	7'7"
135	7'4"
140	7'1"
145	6'9"
150	6'7"
155	6'6"
160	6'4"
165	6'2"
170	6'0"
175	5'11"
180	5'9"
185	5'7"
190	5'6"
195	5'5"
200	5'4"
205	5'2"
210	5'1"
220 and over	5'0"

3. Equipment

a. Hood – The hood will be of neutral color, the outer surface of rough material, split at the open end so that it will come down over the chest and back.

b. Collapse Board – A board will be provided for use in case the ISDP collapses.

c. Restraints – Restraints will be used to ensure that the hands and arms of the ISDP are securely held to his/her front and sides.

d. Rope –The rope will be of manila hemp, at least 3/4 inch and not more than 1 ¼ inches in diameter and approximately 30 feet in length. The rope will be soaked and then stretched while drying to eliminate any spring, stiffness, or tendency to coil. The knot will be treated with wax, soap, or clear oils ensuring a smooth sliding action through the knot. The knot will be tied according to Army regulations.

4. Execution Process

a. Restraints will be placed on the ISDP by assigned staff.

b. The ISDP will be escorted to the gallows area and placed, standing, in the spot designated by the Superintendent. The Superintendent will ask if there are any last words.

c. The hood will be placed on the ISDP and leg restraints applied. If a collapse board appears to be necessary, the escorts will put the board in place.

d. The noose will be placed snugly around the ISDP's neck in such a manner that the knot is directly behind the left ear.

e. The Superintendent will direct the trapdoor to be released.

f. The escorts will move to the lower floor location to assist with removal of the deceased ISDP. The curtains will be closed.

g. At a time deemed appropriate by the Superintendent, the physician will be called to make a pronouncement of death.

X. Post Execution Procedure

A. The Prison Deputy Secretary will notify the Secretary and Command Center of the time of death.

B. The Superintendent will inform a designated staff of the time of the death, who will then inform the witnesses.

C. The witnesses will be escorted out of the execution area immediately after the pronouncement of death.

D. The media witnesses will be escorted to the Media Briefing Room.

E. The Chaplain will provide official notification to the family of the time of death.

F. After the Death Certificate is signed, the body will be removed from the facility by a pre-determined route.

G. A post-trauma specialist and the Chaplain will be available to staff preceding, during, and after the execution. Staff will also be provided a confidential list of off-site locations where counseling and/or spiritual support will be available.

H. Within 20 days after the execution, the Superintendent will return the Death Warrant to the clerk of the trial court from which it was issued along with the log identified in the Pre-Execution Procedure Section of this policy.

DEFINITIONS:

The following words/terms are important to this policy and defined in the glossary section of the Policy Manual: Judicial Officer, Law Enforcement Representatives, Representative from the Family of the Defendant, Representatives of the Families of the Victim(s). Other words/terms appearing in this policy may also be defined in the glossary.

ATTACHMENTS:

Execution Procedures and Assignments Checklist (Attachment 1)

DOC FORMS:

None

Exhibit 4

Research Letters

Inadequate anaesthesia in lethal injection for execution

Lancet 2005; 365: 1412–14
See Editorial page 1361

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Leonidas G Koniaris, Teresa A Zimmers, David A Lubarsky, Jonathan P Sheldon

Anaesthesia during lethal injection is essential to minimise suffering and to maintain public acceptance of the practice. Lethal injection is usually done by sequential administration of thiopental, pancuronium, and potassium chloride. Protocol information from Texas and Virginia showed that executioners had no anaesthesia training, drugs were administered remotely with no monitoring for anaesthesia, data were not recorded and no peer-review was done. Toxicology reports from Arizona, Georgia, North Carolina, and South Carolina showed that post-mortem concentrations of thiopental in the blood were lower than that required for surgery in 43 of 49 executed inmates (88%); 21 (43%) inmates had concentrations consistent with awareness. Methods of lethal injection anaesthesia are flawed and some inmates might experience awareness and suffering during execution.

Since 1976, when the death penalty was reinstated, 959 people have been executed in the USA.[1] Lethal injection has eclipsed all other methods of execution because of public perception that the process is relatively humane and does not violate the Eighth Amendment prohibition against cruel and unusual punishment. US courts recognise "evolving standards of decency that mark the progress of a maturing society", and prohibit punishments that "involve the unnecessary and wanton infliction of pain", "involve torture or a lingering death", or do not accord with "the dignity of man".[2]

Lethal injection usually consists of sequential administration of sodium thiopental for anaesthesia, pancuronium bromide to induce paralysis, and finally potassium chloride to cause death.[3] Without anaesthesia, the condemned person would experience asphyxiation, a severe burning sensation, massive muscle cramping, and finally cardiac arrest. Thus, adequate anesthesia is necessary both to mitigate the suffering of the condemned and to preserve public opinion that lethal injection is a near-painless death. By contrast with its medical applications, however, anaesthesia in execution has not been subjected to clinical trials, governmental regulation, extensive training of practitioners, standardisation, or the supervision of peer-review and medicolegal liability. Furthermore, the American Medical Association and American Nurses Association strictly oppose participation of their members in executions. We postulated that anaesthesia methods in lethal injection might be inadequate.

To assess anaesthesia methods, we sought protocol information from the states of Texas and Virginia, where 45·4% of executions are done, by a combination of statutory records requests to the Texas Department of Criminal Justice and the Virginia Department of Corrections, along with personal interviews and sworn testimony of corrections officials involved in executions. We noted that: neither state had a record of the creation of its protocol (Texas Department of Criminal Justice Assistant General Counsel, January and February, 2004; and Virginia Department of Corrections Director of Communications, December, 2003; written communications); executioners—typically one to three emergency medical technicians or medical corpsmen—had no training in anaesthesia (Virginia Department of Corrections Director of Communications, written communication; and personal interview of a former senior Texas corrections official who witnessed 219 Texas executions: hereafter "personal interview");[4] after placement of one or two intravenous lines, executioners stepped behind a wall or curtain and remotely administered drugs to the conscious inmate (personal interview);[4] no direct observation, physical examination, or electronic monitoring took place for anaesthesia (personal interview);[4] and there was no data collection, documentation of anaesthesia, or post-procedure peer review (Virginia Department of Corrections Director of Communications, written communication; and personal interview). No assessment of depth of anaesthesia or loss of consciousness was done; apparently anaesthesia is assumed because a relatively large quantity of thiopental is specified (usually 2 g) compared with the typical clinical induction dose of 3–5 mg/kg, immediately followed by 1–1·5 mg/kg per min for maintenance; this dose equates to 270–450 mg for induction and 90–135 mg/min maintenance for a 200 lb man.

The assumption that 2 g thiopental assures anaesthesia is overly simplistic, however. First, technical difficulties or procedural errors by poorly trained executioners might hinder administration of the total dose. Second, if thiopental anaesthesia were maintained at standard infusion rates, the total dose for a 10-min procedure in a 100 kg man would be 1·3–2·0 g. Thus the dose used is not excessive for the average time from injection to death (8·4 min, SD 4·7) and might be inadequate if the process took longer.[5] Third, a person anticipating execution would be fearful, anxious, and hyperadrenergic, and would need a higher dose of thiopental than would a premedicated surgical patient. Fourth, inmates with histories of chronic substance misuse problems might have high tolerance to sedative hypnotics and would need increased doses of anaesthetic.

Because no documentation of anaesthesia in the execution chamber existed, the only available objective data were postmortem concentrations of thiopental. Texas and Virginia refused to provide such data, but we obtained autopsy toxicology results from 49 executions in

Arizona, Georgia, North Carolina, and South Carolina. Toxicology reports were generated by MedTox Laboratories (St Paul, MN) for Arizona and are available in Beardslee versus Woodford, No C-04-5381 (Northern District of California, 2004). Data from the Division of Forensic Sciences Georgia Bureau of Investigation are available in State versus Nance, Superior Court Indictment No 95-B-2461-4. North Carolina reports were obtained directly from the Office of the Chief Medical Examiner. South Carolina Law Enforcement Division Toxicology Department reports were obtained by attorney David Barron, Kentucky Department of Public Advocacy Capital Post-Conviction Unit (personal communication) and are available in Hill versus Ozmint, No 2:04-0489-18AJ (District of South Carolina, 2004). Although the protocols of all four states are similar to those of Texas and Virginia, and specify that 2 g thiopental is used, concentrations of the drug in the blood ranged from only trace amounts to 370 mg/L (median 15·5 mg/L; figure 1). Thiopental concentrations did not fall with increased time between execution and blood sample collection (data not shown), consistent with data showing that thiopental is quite stable in stored human plasma.[6]

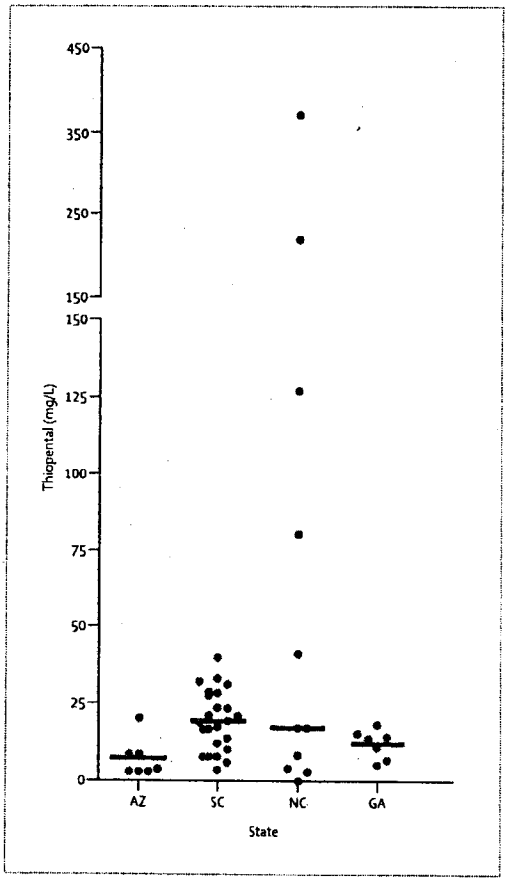

Figure 1: **Individual post-mortem thiopental concentrations in blood by state**
Lines show medians. Note different scales. GA sampled several sites in five individuals; the highest values are shown. GA values were reported as plus or minus 25%. AZ and SC did not report site of blood sampling. NC results were each from a single site, including subclavian artery, jugular vein, femoral vein, or vena cava.

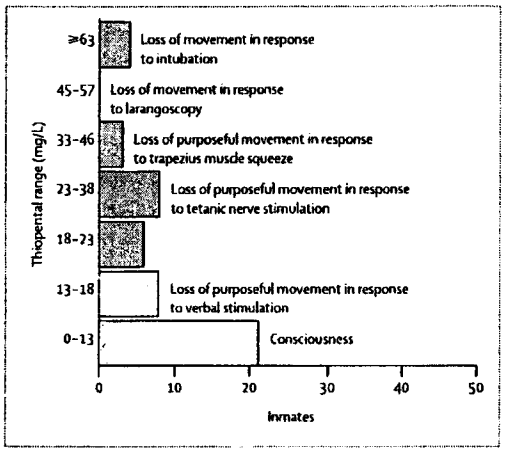

Figure 2: **Number of executed inmates with post-mortem thiopental concentrations within range for indicated clinical endpoint**
Ranges are 95% CI of the Cp50 for the stimuli.

Extrapolation of antemortem depth of anaesthesia from post-mortem blood thiopental concentrations is admittedly problematic. To estimate concentrations of thiopental in the brain from concentrations in the blood in life, details of the rate and duration of drug administration are needed. Unfortunately, such details are usually not specified in lethal injection protocols. Furthermore, no data about post-mortem distribution of thiopental are available. However, a large range of blood concentrations resulted from nearly identical protocols across and within individual states—from 8·2 mg/L to 370 mg/L in North Carolina for the same sampling site (subclavian artery) and similar collection times (same day or next day, respectively). This finding suggests substantial variations in either the autopsy or anaesthesia methods. Contrasting the expertise of state medical examiners with the relatively unskilled executioners, however, would strongly suggest that the variation is probably due to differences in drug administration in individual executions.

If post-mortem thiopental concentrations are taken as a surrogate marker of concentrations in the blood during life, most of the executed inmates had concentrations that would not be expected to produce a surgical plane of anaesthesia, and 21 (43%) had concentrations consistent with consciousness (figure 2). In a careful study in which actual serum thiopental concentrations were measured against clinical endpoints, the steady state serum concentration needed to produce a 50% probability of no

muscle response (Cp50) after intubation was defined as 78·8 mg/L (SD 2·9).[7] The Cp50 for movement after trapezius muscle squeeze, a stimulus equivalent to skin incision, was 38·9 mg/L (3·3). Remarkably, 43 of the 49 inmates had blood thiopental concentrations below this level. Most worryingly, 21 inmates had concentrations less than the Cp50 for repression of movement in response to a vocal command. In view of these data, we suggest that it is possible that some of these inmates were fully aware during their executions. We certainly cannot conclude that these inmates were unconscious and insensate. However, with no monitoring and with use of the paralytic agent, any suffering of the inmate would be undetectable.

With little public dialogue about protocols for killing human beings, it is pertinent to consider recommendations from animal euthanasia protocols. The American Veterinary Medical Association (AVMA) panel on euthanasia specifically prohibits the use of pentobarbital with a neuromuscular blocking agent to kill animals,[8] and 19 states, including Texas, have expressly or implicitly prohibited the use of neuromuscular blocking agents in animal euthanasia because of the risk of unrecognised consciousness.[2] Furthermore, AVMA specifies that "it is of utmost importance that personnel performing this technique are trained and knowledgeable in anaesthetic techniques, and are competent in assessing anaesthetic depth appropriate for administration of potassium chloride intravenously. Administration of potassium chloride intravenously requires animals to be in a surgical plane of anesthesia characterized by loss of consciousness, loss of reflex muscle response, and loss of response to noxious stimuli".[8] The absence of training and monitoring, and the remote administration of drugs, coupled with eyewitness reports of muscle responses during execution, suggest that the current practice of lethal injection for execution fails to meet veterinary standards.[1]

Our data suggest that anaesthesia methods in lethal injection in the USA are flawed. Failures in protocol design, implementation, monitoring and review might have led to the unnecessary suffering of at least some of those executed. Because participation of doctors in protocol design or execution is ethically prohibited, adequate anaesthesia cannot be certain. Therefore, to prevent unnecessary cruelty and suffering, cessation and public review of lethal injections is warranted.

Contributors

L G Koniaris and J P Sheldon conceived the study. J P Sheldon collected the protocol information. J P Sheldon and T A Zimmers collected the toxicology data. D A Lubarsky, L G Koniaris, and T A Zimmers assessed the protocol information and toxicology data. All authors participated in the writing and editing of the manuscript. L G Koniaris and T A Zimmers contributed equally to the work.

Conflict of interest statement

JS is an attorney who represents inmates sentenced to death. None of the other authors has a conflict of interest.

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